

**SUMMARY OF RESULTS FROM THE
CALIFORNIA PESTICIDE ILLNESS
SURVEILLANCE PROGRAM
- 2008 -**

HS-1883

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Pesticide Illness Surveillance Program – 2008

Executive Summary:

This report describes illnesses identified by the Pesticide Illness Surveillance Program of the California Department of Pesticide Regulation (DPR) during 2008. DPR assigned 1,275 cases for investigation in 2008, a 14% drop relative to the 1,479 cases assigned in 2007, but within the range typical of recent years. The California Poison Control System (CPCS) remained a major source of case identification. Of the 1,275 cases initiated in 2008, CPCS transmitted reports of 562 (44%) (a minor increase from the 538 reported in 2007).

DPR scientists concluded that pesticide exposure had been at least a possible contributing factor to 895 (70%) of the 1,275 cases. Agriculture was the source of pesticide exposure in 311 (35%) of the 895 cases.

In 2008, DPR's pesticide safety outreach efforts included publication of a community guide to recognizing and reporting pesticide problems. The guide is available in English and Spanish. In 2008, Worker Health and Safety Branch outreach workers distributed copies of the community guide along with other safety information at about 60 health and service oriented events attended by an estimated total of thirty thousand people at risk, with Spanish-speaking farm workers and their families heavily represented. A bicultural worker also gave four interviews to Spanish-language broadcast media, potentially reaching thousands more. DPR also sponsored training at each CPCS division to assure that poison control specialists have access to accurate and timely information on pesticide characteristics.

Computer upgrades increased protection for confidential information while facilitating collaboration with agricultural commissioners and partners at state and federal agencies. DPR also continues to facilitate calls to agricultural commissioners via a statewide toll free phone number (1-87-PestLine, or 1-877-378-5463) and to participate in the Border 2012 project, helping to coordinate border-area focus groups and plan for international cooperation in illness surveillance.

Background on the Reporting System

The Department of Pesticide Regulation (DPR) administers the California pesticide safety program, widely regarded as the most stringent in the nation. Mandatory reporting of pesticide¹ illnesses has been part of this comprehensive program since 1971. Illness reports are collected, evaluated, and analyzed by the Pesticide Illness Surveillance Program (PISP). PISP is the oldest and largest program of its kind in the nation; its scientists provide data to regulators, advocates, industry, and individual citizens.

The U.S. Environmental Protection Agency (U.S. EPA) and the National Institute for Occupational Safety and Health (NIOSH) have encouraged other states to develop programs similar to PISP. Through the NIOSH Sentinel Event Notification System for Occupational Risk (SENSOR), federal grants partially support programs in the states of Iowa, Michigan, New York, and Washington. SENSOR also provides technical assistance to the states of Arizona, Florida, Louisiana, New Mexico, North Carolina, Oregon, and Texas. In addition, it supports pesticide-related work by the Occupational Health Branch of the California Department of Public Health (CDPH), which coordinates with DPR's Worker Health & Safety (WHS) Branch. U.S. EPA continues to rely heavily on California data for evidence of pesticide adverse effects because of the large volume of cases and long historical perspective that PISP provides.

DPR scientists participate in the national working group on pesticide illness surveillance that NIOSH convened to develop standards for information collection. In 1998, DPR expanded the PISP database and incorporated several features from the NIOSH standards. These upgrades

¹ "Pesticide" is used to describe many substances that control pests. Pests may be insects, fungi, weeds, rodents, nematodes, algae, viruses, or bacteria -- almost any living organisms that cause damage or economic loss, or transmit or produce disease. Therefore, pesticides include herbicides, fungicides, insecticides, rodenticides, and disinfectants, as well as insect growth regulators. In California, adjuvants are also subject to the regulations that control pesticides. Adjuvants are substances added to enhance the efficacy of a pesticide, and include emulsifiers, spreaders, and wetting and dispersing agents.

have been applied to all data collected from 1992 through the present. Data earlier than 1992 will be presented when historical perspective is required.

Excessive exposure to pesticides may cause illness by various mechanisms, and the surveillance program attempts to collect information about all of them. Every pesticide active ingredient has a mechanism of action by which it controls its target pests. Pesticide products may have other potentially harmful properties in addition to the qualities intended to control pests. PISP collects information on any adverse effects from any component of pesticide products, including the active ingredients, inert ingredients, impurities, and breakdown products. DPR has a mission to mitigate any pesticide exposure that compromises health or safety. This responsibility applies to health effects from products that act as irritants or as allergens, through their smells or by causing fires or explosions, as well as to classical toxic effects.

Sources of Illness Information

Under a statute enacted in 1971 and amended in 1977 (now codified as Health and Safety Code section 105200), California physicians are required to report any suspected case of pesticide-related illness or injury by telephone to the local health officer within 24 hours of examining the patient. This law applies to all types of pesticides (e.g., insecticides, herbicides, disinfectants) and to any location (e.g., farm, home, office). Each California county has a health officer with broad responsibility for safeguarding public health. A few cities employ their own health officers, with comparable responsibilities. These officials may investigate pesticide incidents to the extent necessary to fulfill their mandates. The law only requires them to inform the county agricultural commissioner (CAC) and to complete a pesticide illness report (PIR), which they send to the Office of Environmental Health Hazard Assessment (OEHHA), the Department of Industrial Relations (DIR), and DPR. Unfortunately, this reporting pathway identifies only a minority of the cases investigated.

Pesticide Illness Surveillance Program – 2008

DPR strives to ensure that PISP captures the majority of significant illness incidents and records them in its database. To identify pesticide cases that may go unreported by doctors, DPR has negotiated a memorandum of understanding with DIR and CDPH, under which DPR scientists review copies of the Doctor's First Report of Occupational Illness and Injury (DFROII), documents that the California Labor Code requires workers' compensation claims payers to forward to DIR. Scientists select for investigation any DFROII that mentions a pesticide, or pesticides in general, as a possible cause of injury. Reports that mention unspecified chemicals are also investigated if the occupation or setting is one in which pesticide use is likely. From 1983 through 1998, DFROII review identified the majority of the cases investigated.

In 1999, the California Poison Control System (CPCS) began assisting in pesticide illness reporting. Cooperation with CPCS identified hundreds of symptomatic exposures that otherwise would have escaped detection, but the 2002 state budget crisis prevented continuation of the contract after federal funding ended. When DPR's financial footing improved, the Department renewed its contract with CPCS in 2006. CPCS facilitation of illness reporting resumed in October 2006. DPR also continues to cooperate with OEHHA in efforts to provide the public and the health care community with information on pesticide safety and public health surveillance.

Agricultural commissioners investigate all identified pesticide illnesses that occur in their jurisdictions, whether or not they involve agriculture. They attempt to locate and interview all people with knowledge of the exposure events, collect samples when useful, and review relevant records. When appropriate, they request authorization from the affected people to obtain relevant portions of their medical records to include with the investigative reports. Medical record authorizations comply with the federal Health Insurance Portability and Accountability Act (HIPAA) and include commitments to maintain confidentiality in accordance with the California Information Practices Act.

DPR provides instructions, training and technical support for investigators. The instructions include directions for when and how to collect samples of foliage, clothing, or surface residues to document environmental exposures. As part of the technical support, DPR contracts with a California Department of Food and Agriculture Center of Analytical Chemistry to analyze the samples.

When investigations are complete, CACs send reports to DPR describing their findings. These reports describe the circumstances that may have led to pesticide exposure and the consequences to the exposed individuals. In their role as enforcement agents, CACs also determine whether pesticide users complied with safety requirements.

In an exception to the procedure described above, DPR recommends that CACs not contact people who attempted suicide or their families. CACs learn what they can from ancillary sources, which are often constrained by confidentiality considerations. DPR advocates respect for the privacy of people in difficult circumstances, and for that reason will forego collecting information of toxicological interest.

Along with describing exposure circumstances and other related case information, the CAC's investigation reports identify all the people known to have been exposed. DPR staff add records to the PISP database for any people not previously reported by other mechanisms. DPR scientists evaluate medical reports and all information the CACs gather in the investigative process. They abstract and encode basic descriptors of the event. They then undertake a complex synthesis of all available evidence to assess the likelihood that pesticide exposure caused the incident. Standards for the determination are described in the PISP program brochure, "Preventing Pesticide Illness," which can be viewed or downloaded from DPR's Web site at <http://www.cdpr.ca.gov/docs/whs/pisp/brochure.pdf>.

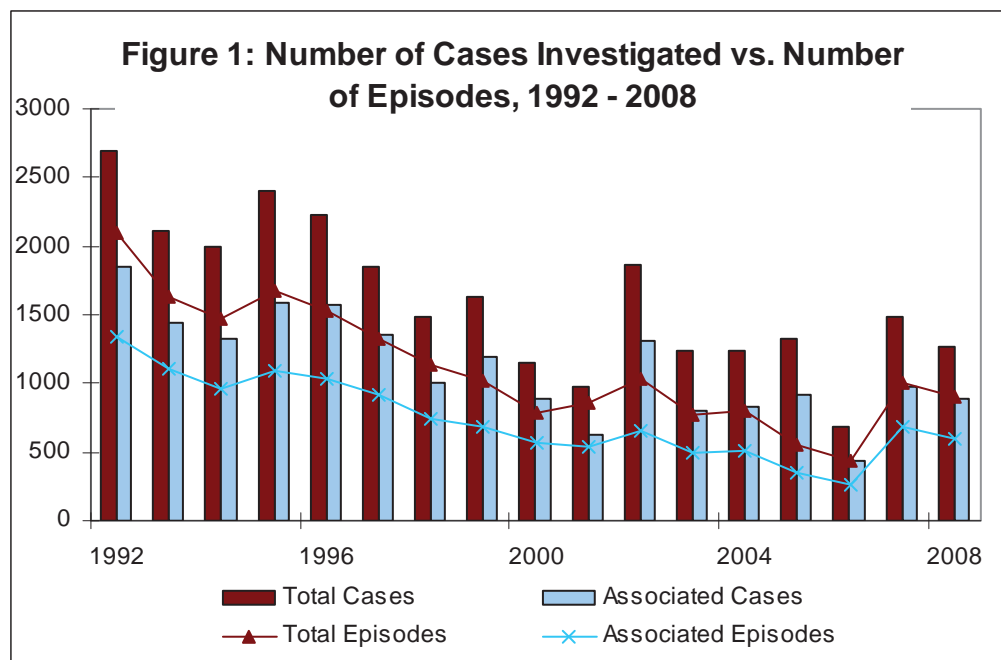
Purpose of Pesticide Illness Surveillance

DPR maintains its surveillance of human health effects of pesticide exposure in order to evaluate the circumstances of pesticide exposures that result in illness. DPR scientists regularly consult the PISP database to evaluate the effectiveness of DPR's pesticide safety regulatory programs and assess need for changes. If illness reports indicate excessive risk, DPR may implement additional California restrictions on pesticide use by providing CACs with recommendations for permit conditions or by changing regulations. For example, DPR may adjust the restricted entry interval (REI) following pesticide application, specify buffer zones or other application conditions, or require pesticide handlers to use protective equipment that meets certain standards. In some instances, changes to pesticide labels provide the most appropriate mitigation measures. Since the U.S. EPA has exclusive authority to require label changes, DPR cooperates with U.S. EPA to develop appropriate instructions for users throughout the country or, alternatively, for a California-specific label. If an illness incident results from illegal practices, state and county enforcement staff take appropriate action to deter future incidents.

During 2008, WHS incorporated illness data into a finalized risk characterization document for endosulfan (Beauvais, 2008) and into an overview of phosphine-generating pesticides (Fong, Johnson, Schneider, 2008).

2008 Numeric Results – Totals

In 2008, DPR assigned 1,275 cases for investigation (see Figure 1). This represents a 14 percent decrease from the number of cases investigated in 2007, but remains within the range typical of recent years. Continued participation by CPCS provided 562 of the case reports.



A case is the Pesticide Illness Surveillance Program representation of a person whose health problems may relate to pesticide exposure.

An episode is an event in which a single source appears to have exposed one or more people (cases) to pesticides.

Associated cases are those evaluated as definitely, probably, or possibly related to pesticide exposure. A definite relationship indicates a high degree of correlation between the pattern of exposure and resulting symptomatology. The relationship requires both physical evidence of exposure and medical evidence of consequent ill health to support the conclusions. A probable relationship indicates a relatively high degree of correlation between the pattern of exposure and resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable. A possible relationship indicates that health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

Associated episodes are those in which at least one case was evaluated as associated.

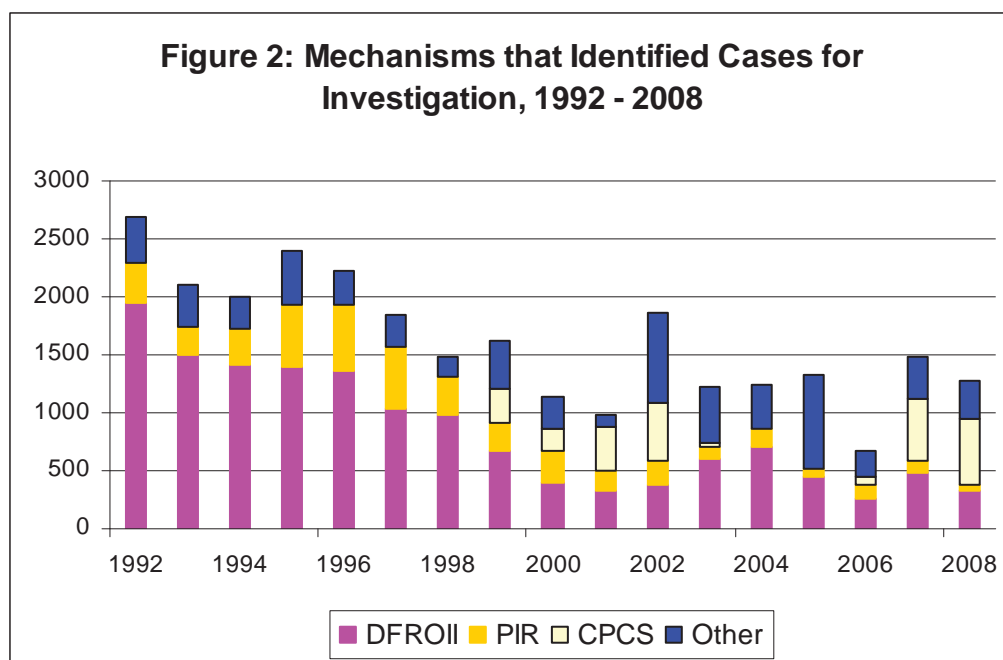
DPR will continue to explore ways to improve identification of pesticide illnesses. Current initiatives focus primarily on education to familiarize medical workers and potential victims with the importance of reporting pesticide illnesses. Along with safety strategies, DPR includes information on protective laws and regulations in material for farm workers and other groups potentially isolated by poverty and/or lack of English fluency. This material features explanations of the surveillance program, the legal requirement for reporting, and legal safeguards against retaliation. During 2008, DPR developed a “Community Guide to

Recognizing and Reporting Pesticide Problems,” in English and Spanish, which encourages community members to communicate problems to competent authorities. DPR also distributes English and Spanish versions of a laminated pocket card with toll-free numbers people can call to get help for pesticide problems.

DPR also partners with OEHHA to make resources available to the medical community. In particular, during 2008 DPR and OEHHA presented training on pesticide resources to each division of CPCS. More recently, DPR released a protocol to help coroners investigate fatalities in which they suspect pesticide involvement (O’Malley, 2009). It includes broadly applicable information on availability of relevant clinical and toxicological tests.

Figure 2 demonstrates the variation in numbers of cases identified by the different sources as well as an overall downward trend. Investigations so far suggest the trend is probably real, but reliance on manual processing introduces uncertainty that complicates analysis. Automated means of identifying pesticide related illnesses, such as access to electronic access worker’s compensation data, would greatly improve the reliability and consistency of these data. Figure 2 also reflects the fact that PISP receives a substantial number of reports outside of the standard PIR and DFROII-based pathways. Such episodes may come to the CACs’ attention via emergency response contacts, news reports, through direct citizen complaints, or by their own observations.

When CACs investigate episodes, they record information about all the affected people they identify. If those people had not previously been reported, they are added to the database when CAC reports reach DPR.



DFROI – Doctor's First Report of Occupational Illnesses and Injury (Workers' Compensation document).

PIR – Pesticide Illness Report (physician reporting in compliance with Health and Safety Code Section 105200).

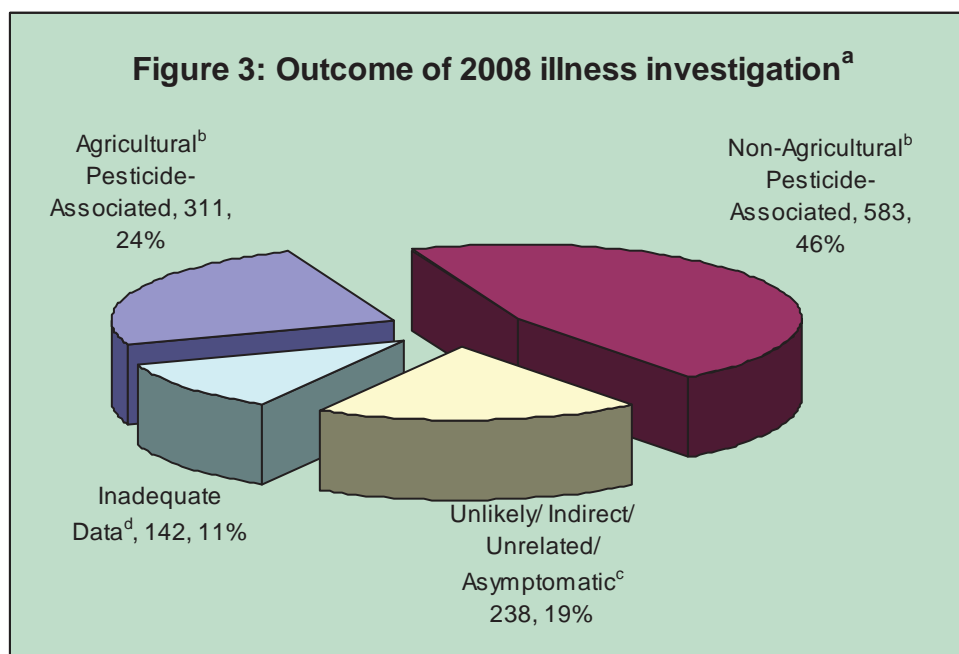
CPCS – California Poison Control System (facilitated physician reporting).

Other – All other methods of case identification, including citizen complaints, contacts by emergency responders, and news reports.

DPR scientists found that pesticide exposure had been at least a possible contributing factor to 895 (70%) of the 1275 cases identified. PISP defines the term “pesticide-associated” as cases evaluated as definitely, probably, or possibly related to pesticide exposure, and “agricultural” as involving pesticides intended to contribute to production of an agricultural commodity, including livestock. All other exposure situations are designated “non-agricultural”. This includes structural, sanitation, or home garden use, as well as pesticide manufacture, transport, storage, and disposal.

Of the 895 pesticide-associated cases, 311 (24% of the 1275 total cases) were attributed to pesticides used for agricultural purposes. Another 583 associated cases (46% of the total of

1275) occurred in non-agricultural circumstances. One case could not be characterized as agricultural or non-agricultural. Evidence indicated that pesticide exposure did not cause or contribute to ill health in 238 (19%) of the 1275 cases assigned for investigation. Insufficient information prevented evaluation of 142 cases (11%) (Figure 3).



^a Total cases investigated = 1275

^b *Agricultural* and *Nonagricultural* refer to the intended use of the pesticides definitely, probably, or possibly related to human health effects. This chart omits one case that could not be characterized as agricultural or non-agricultural.

^c *Unlikely/Indirect/Unrelated/Asymptomatic* refers to cases in which the weight of the evidence was against pesticide causation. This occurs when exposed people did not develop symptoms, or if symptoms were not caused or were unlikely to have been caused by pesticide exposure.

^d *Inadequate* means that there was not enough data available or reported to determine if pesticides contributed to ill health.

Table 1 shows the numbers of cases evaluated at each level of relationship. Among the 895 pesticide-associated cases, evidence established a definite relationship to pesticide exposure for 105 (12%), a probable relationship for 544 (61%), and a possible relationship for 246 (27%) (Table 1).

Table 1: Relationship Evaluation of 2008 Illness Investigations				
Relationship	Relation to Agriculture			Total
	Agricultural ^a	Non-Agricultural	Unknown or Not Applicable ^j	
Definite ^b	8	97	0	105
Probable ^c	221	323	0	544
Possible ^d	82	163	1	246
Pesticide-Associated Subtotal	311	583	1	895
Unlikely ^e	11	45	2	58
Indirect ^f	0	10	0	10
Asymptomatic ^g	35	15	0	50
Unrelated ^h	0	0	120	120
Not Applicable (inadequate data) ⁱ	20	98	24	142
Overall Total	377	751	147	1275

^a Agricultural cases are those that implicate exposure to pesticides intended to contribute to the production of agricultural commodities.

^b A definite relationship indicates a high degree of correlation between the pattern of exposure and resulting symptomatology. The relationship requires both physical evidence of exposure and medical evidence of consequent ill health to support the conclusions.

^c A probable relationship indicates a relatively high degree of correlation between the pattern of exposure and resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.

^d A possible relationship indicates that health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

^e An unlikely relationship indicates that a correlation cannot be ruled out absolutely. Medical and/or physical evidence suggest a cause other than pesticide exposure.

^f An indirect relationship indicates that pesticide exposure is not responsible for symptomatology, but pesticide regulations or product label contributed in some way, (e.g., heat stress while wearing chemical resistant clothing).

^g An asymptomatic relationship indicates that exposure occurred, but did not result in illness/injury.

^h An unrelated relationship indicates definite evidence of causes other than pesticide exposure, including exposure to chemicals other than pesticides.

ⁱ A relationship of "not applicable" indicates that relationship cannot be established because the necessary information is not available to the evaluator.

^j Agricultural designation is not applicable to cases unrelated to pesticide exposure.

Tabular summaries presenting different aspects of the data are available online at <http://www.cdpr.ca.gov/docs/whs/currpisp.htm>, or by contacting the WHS Branch.

Internet users now have the additional option of using the query program, CalPIQ, to develop reports to their own specifications. CalPIQ is available at <http://apps.cdpr.ca.gov/CalPIQ> and can retrieve any cases evaluated as definitely, probably, or possibly related to pesticides from 1992 through the most recent year completed. Users can specify which cases to retrieve based on county of occurrence, year of identification, whether or not agriculture was the source of pesticide exposure, the identity of the implicated pesticide(s), the type of location where exposure occurred (e.g., farm, school), the intended pesticide application site (e.g., grapes, food handling equipment), the manner of exposure (e.g., drift, direct spray), and/or activity of the affected people (e.g., applicator, field worker). Users can direct CalPIQ to retrieve either descriptions of each individual case or the total number of cases that match the selected criteria (summary report). If they select the summary report option, users may request subtotals by activity, county, type of exposure, type of location, and/or year of identification.

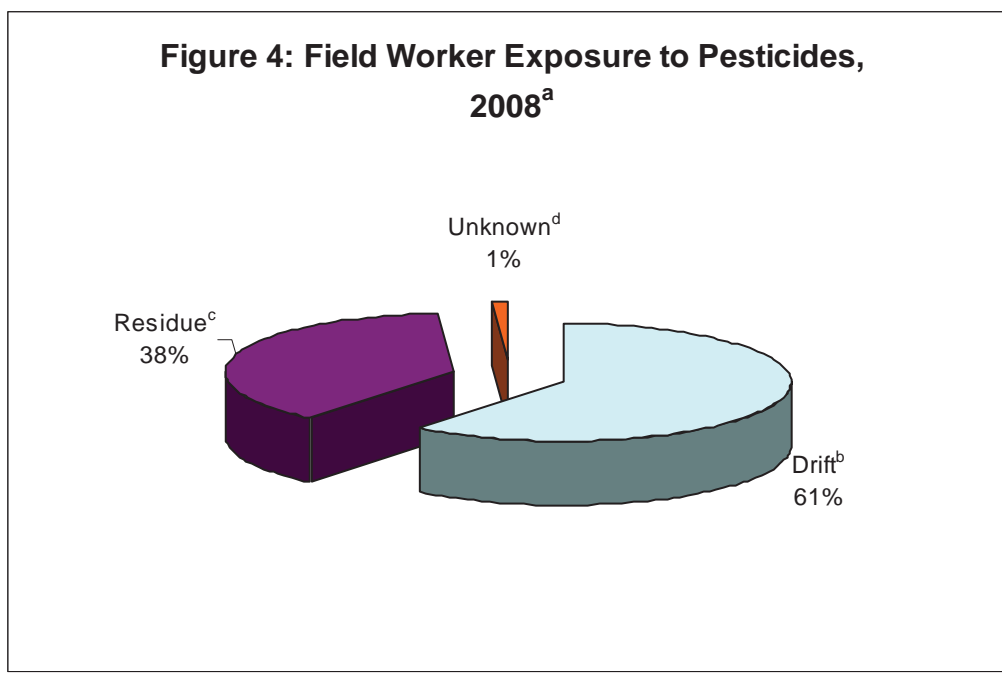
Occupational exposures (those that occurred while the affected people were at work) accounted for 552 (62%) of the 895 pesticide-associated cases from 2008. Occupational exposures typically predominate among the cases PISP collects, reflecting the impact of DFROIs (workers' compensation documents) for identifying cases. Non-occupational exposures accounted for 341 pesticide-associated cases (38% of the total). Two pesticide-associated cases could not be characterized as occupational or non-occupational.

Enforcement actions often are still under consideration when DPR receives the illness investigative reports, thus identification of violations is difficult. Based on the information available at the time of evaluation, WHS scientists concluded that 441 (49%) of the 895 pesticide-associated cases provided evidence that violation of safety requirements had contributed to exposure, and harm might have been avoided if all the people involved had adhered strictly to safety procedures already required by regulations and pesticide labels. In 143

cases (16%), violations were identified but judged not to have contributed to pesticide exposure; scientists remained uncertain whether violations contributed to 67 cases (7%). In 244 (27%) of the pesticide-associated cases, health effects were attributed to pesticide exposure in spite of apparent compliance with all applicable label instructions and safety regulations. Further evaluation of these cases is needed to determine if additional safety requirements are appropriate.

Agricultural Field Worker Incidents

In 2008, 194 cases of field worker illness or injury were evaluated as definitely, probably or possibly related to pesticide exposure. One-hundred-nineteen of these cases involved exposure in 14 drift episodes while 73 involved exposure to pesticide residue in 15 separate episodes. The exposures of the remaining two cases could not be characterized with confidence (Figure 4).



^aTotal pesticide-associated field worker cases = 194

^b Drift refers to field worker cases associated with exposure to off-site movement of a pesticide from an application.

^c Residue refers to field worker cases associated with exposure to residue from a previously applied pesticide.

^d Unknown indicates that PISP Scientists could not determine how field worker exposure occurred

Residue: Fifty of the 73 residue exposures were evaluated as probably related to reported health effects. The other 23 field worker residue exposures were evaluated as possibly related.

Fifty-six (77 %) of the residue exposures were associated with a single episode in Monterey County. Approximately seventy strawberry harvesters (including supervisors) started work in an area that had last been sprayed nearly a month earlier. Crew members began to develop symptoms as they moved into a section of the field treated three days earlier with the fungicides captan and myclobutanil and the insecticides fenprothrin and naled. Most workers developed nose, eye and upper respiratory tract irritation; but as the morning progressed, some workers felt nauseated and developed headaches. Three-and-a-half hours after they had started working, a majority of the crew complained of symptoms, and the field supervisor informed the grower. The grower visited the worksite where she, too, soon developed respiratory symptoms. About two hours after she arrived, she offered the crew the choice of going home or seeking medical care.

Investigators interviewed 65 crew members. Fifty-six of them reported having had health effects. Some workers said they were not offered the option of going for medical care. All the workers went home.

The crew entered the field legally, as the REI (time required to allow for pesticide dissipation) for that section of the field had elapsed. No other source of pesticide exposure could be identified, however. No reported pesticide applications occurred within 2500 feet of the field on the day that the crew was harvesting strawberries. The most recent aerial application occurred the day before, 900 feet away. A few workers described more recent nearby applications but these applications were not documented and could not be verified. Nineteen workers, two of whom had asthma and one of whom had allergies, said they detected an odor. Some workers said they observed “dust” while harvesting, but the dust was not identified. DPR scientists concluded that 48 of the workers had probably reacted to residues of captan, myclobutanil, fenprothrin, and naled, and that this exposure was a possible factor in the symptoms the other eight experienced.

The Monterey County agricultural commissioner found that the grower violated regulations when she did not take her workers for medical care when she suspected they suffered from pesticide toxicity. She also failed to submit required pesticide use reports in the designated time frame. These violations did not contribute to exposure or illness.

Among the other 17 field workers exposed to residue, two were exposed when they entered treated fields prior to the expiration of the REIs. In one instance, a supervisor had removed the warning signs from the treated field four hours before the end of a 24-hour REI and had sent a worker into the field. The grower called the agricultural commissioner, reported the violation, and fired the supervisor. The other reentry violation involved a worker who saw an application in progress and moved to another location. He returned later and mowed a nearby orchard, not knowing that it had been sprayed three hours earlier with a pesticide that requires a 12-hour REI. The operator of the property was at fault for not informing the employee of the applications.

Drift: Drift probably caused or contributed to the symptoms experienced by 90 field workers, and was a possible factor in 29 field worker illnesses. Six of the episodes each affected just one worker. The other eight episodes affected a total of 113 workers.

The largest field worker drift episode occurred in Imperial County, where malathion drifted from an aerial application to alfalfa onto three farm labor crews harvesting a broccoli field half a mile away. Crew leaders initially approved the application, but workers from all three crews soon reported that they smelled a strong, nauseating odor. One crew immediately stopped working and left the field. Those workers stayed well. The other two crews continued working, and workers soon began feeling ill. The foremen then told the workers to leave the field, and took the four workers who were vomiting to a hospital where they showered and changed clothes. Another worker reported persistent symptoms five days later and was sent for care at that point.

Workers, the application spotter, and a local weather station all agreed the wind blew from the application site towards the workers. Environmental samples identified small but unambiguous amounts of drift. A field worker donated his shirt for analysis, and malathion was detected in it,

too. Because of the likelihood of contamination, the grower discarded the broccoli harvested that day and delayed completing the harvest until the investigators' samples showed residues on the crop to be within tolerance.

The Imperial County Agricultural Commissioner was able to interview 46 workers, all based in Arizona. Thirty-four workers, including a farm labor contractor's safety coordinator, reported health effects. Effects on 33 were evaluated as probably due to malathion exposure, and the other symptomatic case was evaluated as possibly related. The other 12 field workers denied experiencing symptoms. The applicator paid a fine of \$5,000.

Three field worker drift episodes occurred in Monterey County. WHS helped to investigate the largest of these, in which 25 workers were exposed to methyl isothiocyanate (MITC), a breakdown product of the fumigant metam-sodium (Hernandez, 2010). Two blocks, both of which adjoined the field where the workers were assigned, had been fumigated earlier that morning. Equipment failure delayed application of the required post-application water treatments to the treated site. The workers left the area when they developed symptoms suggestive of exposure to MITC escaping from the treated field.

In both fields, WHS scientists observed evidence of shortcomings beyond the delayed water seal. In one, large soil clods indicated poor soil preparation, which would allow MITC to off-gas rapidly. In the other, the scientists noticed linear depressions atop some of the beds. This suggested that the press roller did not properly close the injector traces in the treated beds, allowing MITC to escape. The scientists followed up by inspecting the application equipment and found the press roller was misaligned, leading to the malfunction the scientists had inferred, and also that the roller was mounted at a fixed height and did not exert pressure on the soil as it should.

In field worker drift episodes, the workers often smelled odors and felt that foremen overtly or subtly delayed or discouraged them from leaving work to seek medical care. Since the only crew to escape widespread illness was the one that left the field immediately upon sensing drift, it

might seem that prompt departure should be recommended. This summary cannot account, however, for the number of times that workers remained well and continued their jobs in spite of odor. Such episodes are not reported to illness surveillance (since no one is ill). Without knowing how frequently field crews smell odors and remain well, we cannot draw firm conclusions about the episodes in which workers smell odors and get sick.

Drift Exposure

The PISP defines drift exposure as exposure to pesticide “spray, mist, fumes, or odor carried from the target site by air.” This definition differs from the regulatory definition in that the PISP definition includes exposures to fumigants that escape confinement. Additionally, the PISP definition of drift includes episodes in which air movement carried pesticide and caused exposure of pesticide handlers. (Regulations provide specific protections for pesticide handlers, who perform tasks such as applications and preparations for applications.) Airborne exposure of handlers is not drift in the usual sense, but recording it provides information about the mechanism of exposure to pesticide users.

In 2008, DPR recorded a total of 285 individuals who reported symptoms evaluated as definitely, probably, or possibly related to exposure to drift (Table 2) in 127 separate episodes. One non-agricultural episode is counted twice in Table 2, because it affected both the applicator (a woman who combined incompatible cleaning products) and her mother, who smelled the irritant gas and went to get her daughter.

The major field worker episodes are described above, in the section on field workers. Non-agricultural drift affected primarily pesticide handlers. Antimicrobial pesticides were the major class implicated. Agricultural drift affected two large groups of people other than field workers.

Table 2: Pesticide Drift Episodes that Occurred During 2008					
Type of Pesticide	Activity of Affected Individuals ^a	Agricultural ^b		Non-Agricultural ^b	
		Episodes ^c	Affected Individuals ^d	Episodes ^e	Affected Individuals ^d
Insecticides					
	Handlers	1	1	9	9
	Field Workers	4	37	0	0
	Others	3	3	8	8
Fumigants					
	Handlers	1	1	0	0
	Field Workers	2	39	0	0
Antimicrobials					
	Handlers	1	1	57	58
	Others	0	0	19	22
Other					
	Handlers	2	2	6	6
	Field Workers	8	43	0	0
	Others	5	53	3	3
Total					
	Handlers	5	5	72	73
	Field Workers	14	119	0	0
	Others	8	56	30	33

^a Describes the people's activity at the time of exposure. Handlers include people mixing, loading and applying pesticides, repairing pesticide equipment and flagging for aerial application. Field Workers are people working in agricultural fields at the time of drift exposure.

^b Designation as agricultural indicates exposure to pesticides intended to contribute to production of an agricultural commodity, including livestock. Any other exposure situation is designated non-agricultural.

^c Number of people who developed symptoms evaluated as definitely, probably, or possibly caused or exacerbated by pesticide exposure. A definite relationship indicates a high degree of correlation between the pattern of exposure and resulting symptomatology. The relationship requires both physical evidence of exposure and medical evidence of consequent ill health to support the conclusions. A probable relationship indicates a relatively high degree of correlation between the pattern of exposure and resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable. A possible relationship indicates that health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

^d One antimicrobial episode appears twice, as affecting an applicator and as affecting another person.

One large agricultural drift episode occurred when residents in their homes smelled the herbicide bensulide and the insecticide chlorpyrifos applied to a broccoli field about 100 yards away. Monterey County investigators canvassed the neighborhood and identified 24 members of 11 households who experienced symptoms, which were evaluated as probably attributable to drift exposure. The investigators left questionnaires at homes where no one answered the door, but none of the questionnaires was returned.

The other major episode occurred at a citrus packing plant where an additional product, an antimicrobial containing hydrogen peroxide and peroxyacetic acid, was fed into a system that treated lemons with the fungicide imazalil. The antimicrobial label prohibited mixing with anything other than water, so the use was not legitimate. The plant also disregarded a label prohibition against using a solution of the product more than once.

On the second day that the plant used the two products together, 21 workers developed symptoms attributed to vapor drifting from the system, and two others had multiple forms of exposure. Among the 21 who attributed symptoms to drift exposure, PISP scientists evaluated 19 as probably related and two as possibly related. The company paid a total fine of \$16,840 for violations identified during investigation of this episode.

Morbidity and Mortality

Among the 895 cases evaluated as associated with pesticide exposure, 34 people were hospitalized and 117 people reported lost time from work (or normal activity, such as going to school). Approximately 56% (19 of 34) of the reported hospitalizations were due to ingestion of pesticides (18 intentional, one by an autistic man with a history of eating non-food items and who ultimately died of this ingestion). Insecticides and rodenticides were the most commonly ingested pesticides.

Table 3: Summary of Pesticide-Associated^a Hospitalization and Disability, 2008			
Relationship	Total Cases	Number Hospitalized	Lost Work Time
Definite/Probable ^b	649	23	87
Possible ^c	246	11	32
Total Cases	895	34	119

^a Pesticide-associated cases are those in which pesticide exposure was evaluated as a definite, probable, or possible contributor to ill health.

^b A definite relationship indicates a high degree of correlation between the pattern of exposure and resulting symptomatology. The relationship requires both physical evidence of exposure and medical evidence of consequent ill health to support the conclusions. A probable relationship indicates a relatively high degree of correlation between the pattern of exposure and resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.

^c A possible relationship indicates that health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

Drift exposure caused the second greatest number of hospitalizations (6 of 33, 18%). Four of the six drift cases involved people (including three known to have asthma) who mixed incompatible sanitizer/cleaning products and inhaled the resulting irritant gas; another breathed vapor from his spa.

In 2008, PISP received only one report of a child hospitalized due to pesticide exposure. A 15-month-old toddler toppled into a bucket of dilute pine oil sanitizer when her mother, who was mopping the kitchen floor, stepped away briefly to answer the door. When the mother returned 2-3 minutes later, she found her daughter had fallen into the 5-gallon bucket of diluted sanitizer. The child responded to rescue breathing and recovered after 4 to 5 days hospitalization.

Among the other eight hospitalized people, three were exposed to insecticides. Four were each exposed to a pesticide of different class: a fumigant, an antimicrobial, a fungicide, and a wood preservative. The one other person was exposed both to an herbicide and to a rodenticide.

DPR and CACs investigated three deaths in 2008. Two were related to pesticide exposures, both ingestions by adult males reported via CPCS. One fatality involved a suicidal insecticide ingestion. The other fatal case involved a severely autistic man who had a history of pica. He drank an unknown amount of herbicide he may have mistaken for juice. The third case was found not to have been caused by pesticide exposure. An ATV overturned and crushed a rancher as he sprayed to control yellow starthistle.

A fourth death remains under investigation by the Orange County District Attorney. A woman died in custody after acknowledging that she broke into a house under fumigation.

An Emerging Hazard for Health Care Workers

Necessarily, health care facilities regularly use antimicrobial pesticides to maintain sanitation and protect patients and staff from infection. The products used for this essential function are often highly irritating, and several are known allergens. This results in occasional over-exposures to medical workers, as recently reported in a public health newsletter and reprinted in the Journal of the American Medical Association (Lee et al. 2010).

In 2006, PISP scientists began to notice a new pattern of exposure for health care workers: When workers pull sanitizing wipes from dispensers, often hurriedly, drops of sanitizer flick into their eyes. This pattern has persisted through subsequent years. In one case, an investigator learned that, in the five months between the time the first case occurred and the time the report was received and investigated, two more workers had encountered the same problem at the same hospital.

The workers generally denied having received training on safe and effective use of the sanitizers. Several commented that the product seemed to include more liquid than previously. None of the

affected health care workers used eye protection. To protect employees against this and other hazards, facilities that use sanitizers should consider encouraging routine use of eye protection, even if product labels do not require it.

Significance of CPCS Participation

CPCS report facilitation greatly strengthens illness surveillance: CPCS transmits reports more rapidly than other intermediaries, and CPCS identifies qualitatively different exposures from those the program identifies by other means. Table 4 summarizes these characteristics.

Table 4: Characteristics of Report Sources, 2008^a				
	CPCS ^b	Other PIRs ^c	DFROIs ^d	Other Sources ^e
Median days in transit ^f	1	11	102	136
Average days in transit	3	44	154	209
Minimum days in transit	0	1	7	44
Maximum days in transit	74	392	469 ^g	650
Non-occupational exposures	372	9	0	72
Occupational exposures	122	39	244	262
Exposures of children age < 10	106	2	0	10
Hospitalizations	40	2	0	0
Intentional exposures	41	0	1	1
Deaths	2	0	0	2

^a Includes all case reports investigated, whether or not evaluated as associated with pesticide exposure.

^b Cases reported via the California Poison Control System (CPCS).

^c Cases for which physicians submitted Pesticide Illness Reports independently of CPCS.

^d Cases identified through review of Doctor's First Reports of Occupational Illness or Injury

^e Cases identified by other methods, including citizen complaints, contacts by emergency responders, and news reports.

^f Days in transit represents the number of days elapsed between exposure and arrival of a report at DPR.

^g One case, which could not be evaluated, attributed cancer to an exposure that occurred approximately 12,373 days earlier. This case was considered an outlier. The next longest DFROI transit time appears in the table.

“Other” source reports have long transit times because PISP generally does not learn of them until CACs submit investigation reports in which the cases are identified. The table shows,

however, that the “other” sources resemble the standard sources in that they identify primarily adult, occupational exposures. DPR relies almost entirely on CPCS for information about exposures of children and non-occupational exposures, which account for the majority of hospitalizations and deaths from pesticide exposure. Additionally, prompt notification enables more informative investigations.

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Appendix I: Acronyms

CAC	County Agricultural Commissioner
CDPH	California Department of Public Health
CPCS	California Poison Control System
DFROII	Doctor's First Reports of Occupational Illness and Injury
DIR	Department of Industrial Relations
DPR	California Department of Pesticide Regulation
HIPAA	Health Insurance Portability and Accountability Act
NIOSH	National Institute for Occupational Safety and Health
OEHHA	Office of Environmental Health Hazard Assessment
PIR	Pesticide Illness Report
PISP	Pesticide Illness Surveillance Program
REI	Restricted Entry Interval
SENSOR	Sentinel Event Notification System for Occupational Risk
U.S. EPA	United States Environmental Protection Agency
WHS	Worker Health and Safety Branch

**Summary of Illness/Injury Incidents
Reported in California as Potentially Related to Pesticide Exposure
Summarized Statewide and by County of Occurrence¹
2008**

Relationship ²	TOTAL CASES	Type Of Exposure ³				Intended Use ⁴	
		Direct Contact	Drift	Residue	Other/ Unknown	Agricultural	Non- Agricultural
TOTALS							
Definite	105	70	17	1	17	8	97
Probable	544	108	212	91	133	221	323
Possible ⁵	246	24	57	72	93	82	163
Unlikely	58	5	13	20	20	11	45
Indirect	10	0	6	4	0	0	10
Asymptomatic	50	4	29	10	7	35	15
Unrelated	120						
Insufficient	10						
Unavailable	132						
OVERALL	1275 ⁵	211	334	198	270	357	653
COUNTY ⁶							
ALAMEDA							
Definite	3	2	0	0	1	0	3
Probable	11	3	7	1	0	0	11
Possible	4	0	0	1	3	0	4
Asymptomatic	1	1	0	0	0	0	1
Unrelated	2						
Insufficient	1						
Unavailable	7						
AMADOR							
Unavailable	1	0	0	0	0	0	0
BUTTE							
Probable	4	1	2	0	1	2	2
Possible	2	0	0	1	1	1	1
Unrelated	1						
Unavailable	1						
CALAVERAS							
Probable	1	0	0	0	1	0	1

Relationship ²	TOTAL CASES	Type Of Exposure ³				Intended Use ⁴	
		Direct Contact	Drift	Residue	Other/Unknown	Agricultural	Non-Agricultural
Possible	1	0	0	0	1	0	1
Unrelated	2						
COLUSA							
Probable	2	2	0	0	0	0	2
Unavailable	1						
CONTRA COSTA							
Probable	9	1	4	1	3	0	9
Possible	4	0	0	2	2	0	4
Unlikely	3	0	0	1	2	0	3
DEL NORTE							
Probable	1	0	0	1	0	0	1
EL DORADO							
Probable	3	1	1	0	1	0	3
Possible	2	0	1	0	1	0	2
Unrelated	1						
Unavailable	1						
FRESNO							
Definite	5	4	1	0	0	1	4
Probable	16	5	3	1	7	4	12
Possible	12	2	3	4	3	6	6
Unlikely	2	0	0	2	0	1	1
Unrelated	12						
Insufficient	1						
Unavailable	3						
GLENN							
Probable	3	3	0	0	0	2	1
HUMBOLDT							
Definite	1	0	0	0	1	0	1
Probable	2	1	0	1	0	0	2
Possible	1	0	0	0	1	0	1
Unlikely	1	0	0	0	1	0	1
Unavailable	1						
IMPERIAL							
Definite	1	1	0	0	0	0	1

Relationship ²	TOTAL CASES	Type Of Exposure ³				Intended Use ⁴	
		Direct Contact	Drift	Residue	Other/Unknown	Agricultural	Non-Agricultural
Probable	39	1	34	4	0	38	1
Possible	2	0	1	0	1	1	1
Asymptomatic	12	0	12	0	0	12	0
Unavailable	1						
INYO							
Probable	1	1	0	0	0	0	1
Possible	1	1	0	0	0	0	1
KERN							
Definite	1	0	0	0	1	0	1
Probable	11	4	3	1	3	3	8
Possible	7	0	0	3	4	7	0
Unlikely	1	0	0	0	1	0	1
Unrelated	4						
Insufficient	2						
Unavailable	1						
KINGS							
Definite	2	1	1	0	0	1	1
Probable	5	2	2	0	1	3	2
Indirect	2	0	0	2	0	0	2
Unavailable	1	0	0	0	0	0	0
LAKE							
Definite	2	2	0	0	0	0	2
Probable	1	0	0	0	1	0	1
LASSEN							
Probable	1	0	0	0	1	0	1
LOS ANGELES							
Definite	20	9	4	0	7	0	20
Probable	62	21	12	6	23	0	62
Possible	47	1	7	24	15	0	47
Unlikely	7	0	4	1	2	0	7
Indirect	6	0	6	0	0	0	6
Asymptomatic	7	0	0	5	2	0	7
Unrelated	24						
Unavailable	22						

Relationship ²	TOTAL CASES	Type Of Exposure ³				Intended Use ⁴	
		Direct Contact	Drift	Residue	Other/ Unknown	Agricultural	Non- Agricultural
MADERA							
Definite	1	1	0	0	0	0	1
Probable	2	0	1	0	1	1	1
Possible	4	0	1	0	3	4	0
Unlikely	1	0	0	1	0	1	0
Unrelated	1						
MARIN							
Probable	1	1	0	0	0	0	1
Possible	1	1	0	0	0	0	1
Unavailable	1						
MARIPOSA							
Definite	1	1	0	0	0	0	1
MENDOCINO							
Definite	1	0	1	0	0	0	1
Probable	2	0	0	0	2	1	1
Possible	1	0	1	0	0	0	1
Unlikely	1	0	0	0	1	0	0
Insufficient	1						
MERCED							
Definite	2	2	0	0	0	0	2
Probable	10	1	8	1	0	7	3
Possible	1	0	1	0	0	0	1
Unlikely	1	0	0	0	1	0	1
Unrelated	4						
Unavailable	1						
MODOC							
Possible	1	1	0	0	0	1	0
MONTEREY							
Definite	3	3	0	0	0	1	2
Probable	106	3	51	49	3	102	4
Possible	38	2	23	13	0	37	1
Unlikely	4	1	1	0	2	3	1
Asymptomatic	18	0	13	5	0	18	0
Unrelated	2						

Relationship ²	TOTAL CASES	Type Of Exposure ³				Intended Use ⁴	
		Direct Contact	Drift	Residue	Other/Unknown	Agricultural	Non-Agricultural
Insufficient	1						
Unavailable	9						
NAPA							
Definite	1	1	0	0	0	0	1
Probable	3	2	1	0	0	0	3
Possible	1	0	0	0	1	1	0
Unrelated	2						
ORANGE							
Definite	6	6	0	0	0	0	6
Probable	31	5	2	8	16	0	31
Possible	19	0	1	10	8	0	19
Unlikely	4	0	0	2	2	0	4
Indirect	1	0	0	1	0	0	1
Unrelated	10						
Insufficient	1						
Unavailable	14						
PLACER							
Definite	2	2	0	0	0	0	2
Probable	5	2	2	0	1	0	5
Possible	2	0	0	0	2	0	2
Unlikely	1	1	0	0	0	0	1
Unrelated	1						
RIVERSIDE							
Definite	2	1	1	0	0	0	2
Probable	22	6	4	0	12	0	22
Possible	9	3	0	0	6	0	9
Unlikely	1	0	1	0	0	0	1
Asymptomatic	1	0	0	0	1	0	1
Unrelated	5						
Insufficient	2						
Unavailable	11						
SACRAMENTO							
Definite	2	0	2	0	0	0	2
Probable	9	1	3	0	5	0	9

Relationship ²	TOTAL CASES	Type Of Exposure ³				Intended Use ⁴	
		Direct Contact	Drift	Residue	Other/Unknown	Agricultural	Non-Agricultural
Possible	7	1	1	2	3	0	7
Unlikely	2	1	1	0	0	0	2
Unrelated	4						
Unavailable	5						
SAN BENITO							
Probable	1	0	1	0	0	0	1
Possible	1	0	0	1	0	1	0
Unrelated	1						
Unavailable	1						
SAN BERNARDINO							
Definite	11	6	3	0	2	0	11
Probable	29	8	9	3	9	1	28
Possible	4	0	1	1	2	0	4
Unlikely	3	1	2	0	0	0	3
Asymptomatic	2	0	0	0	2	0	2
Unrelated	7						
Unavailable	8						
SAN DIEGO							
Definite	5	5	0	0	0	0	5
Probable	33	9	4	5	15	0	33
Possible	14	4	0	2	8	2	12
Unlikely	12	0	0	7	5	0	12
Indirect	1	0	0	1	0	0	1
Asymptomatic	1	0	0	0	1	0	1
Unrelated	4						
Unavailable	12						
SAN FRANCISCO							
Definite	2	2	0	0	0	0	2
Probable	4	1	0	0	3	0	4
Possible	5	1	2	1	1	0	5
Unavailable	1						
SAN JOAQUIN							
Definite	3	2	0	1	0	1	2
Probable	8	3	2	1	2	1	7

Relationship ²	TOTAL CASES	Type Of Exposure ³				Intended Use ⁴	
		Direct Contact	Drift	Residue	Other/Unknown	Agricultural	Non-Agricultural
Possible	6	1	1	1	3	2	4
Unlikely	1	0	0	1	0	1	0
Asymptomatic	1	1	0	0	0	0	1
Unrelated	1						
Unavailable	2						
SAN LUIS OBISPO							
Probable	2	1	1	0	0	1	1
Possible	3	0	3	0	0	3	0
Unrelated	2						
Unavailable	2						
SAN MATEO							
Definite	2	1	1	0	0	0	2
Probable	2	2	0	0	0	0	2
Possible	1	0	0	0	1	0	1
Unlikely	1	1	0	0	0	0	0
Unrelated	2						
Unavailable	3						
SANTA BARBARA							
Probable	17	2	14	0	1	15	2
Possible	6	1	2	1	2	4	2
Unlikely	1	0	0	1	0	0	1
Asymptomatic	2	0	2	0	0	2	0
SANTA CLARA							
Definite	2	2	0	0	0	0	2
Probable	6	2	2	1	1	0	6
Possible	5	0	0	1	4	1	4
Unrelated	3						
Unavailable	3						
SANTA CRUZ							
Probable	3	0	3	0	0	2	1
Possible	2	1	0	0	1	0	2
Unlikely	1	0	1	0	0	1	0
Unavailable	1						
SHASTA							

Relationship ²	TOTAL CASES	Type Of Exposure ³				Intended Use ⁴	
		Direct Contact	Drift	Residue	Other/Unknown	Agricultural	Non-Agricultural
Definite	3	2	1	0	0	0	3
Unlikely	1	0	0	0	1	0	1
SISKIYOU							
Probable	1	0	1	0	0	0	1
Possible	3	1	0	1	1	2	1
Insufficient	1						
SOLANO							
Definite	4	2	0	0	2	0	4
Probable	14	2	0	7	5	0	14
Possible	5	0	2	0	3	0	5
Asymptomatic	1	0	0	0	1	0	1
Unrelated	3						
Unavailable	1						
SONOMA							
Definite	4	3	1	0	0	1	3
Probable	2	0	1	0	1	0	2
Possible	1	0	0	0	1	0	1
Unrelated	1						
STANISLAUS							
Definite	2	2	0	0	0	1	1
Probable	7	3	2	0	2	1	6
Possible	3	0	1	1	1	1	2
Unlikely	3	0	1	2	0	0	3
Asymptomatic	1	1	0	0	0	0	1
Unrelated	7						
Unavailable	12						
SUTTER							
Probable	3	1	1	0	1	1	2
Possible	1	0	0	1	0	0	1
Unlikely	1	0	0	1	0	0	1
Unrelated	2						
TEHAMA							
Probable	3	1	1	0	1	2	1
TRINITY							

Relationship ²	TOTAL CASES	Type Of Exposure ³				Intended Use ⁴	
		Direct Contact	Drift	Residue	Other/Unknown	Agricultural	Non-Agricultural
Probable	1	0	0	0	1	0	1
TULARE							
Definite	5	3	0	0	2	2	3
Probable	24	3	19	0	2	22	2
Possible	6	1	2	1	2	3	2
Unlikely	4	0	2	0	2	3	1
Asymptomatic	2	0	2	0	0	2	0
Unrelated	7						
Unavailable	2						
TUOLUMNE							
Possible	1	0	0	0	1	0	1
Unavailable	1						
VENTURA							
Definite	4	2	1	0	1	0	4
Probable	15	1	10	0	4	11	4
Possible	8	1	2	0	5	3	5
Unlikely	1	0	0	1	0	1	0
Asymptomatic	1	1	0	0	0	1	0
YOLO							
Definite	2	2	0	0	0	0	2
Probable	4	2	0	0	2	1	3
Possible	3	1	1	0	1	1	2
Unrelated	3						
Unavailable	2						
YUBA							
Probable	2	0	1	0	1	0	2
Possible	1	0	0	0	1	1	0
Unrelated	2						

1. **Source:** California Department of Pesticide Regulation, Pesticide Illness Surveillance Program.
The term “potentially related to pesticide exposure” refers to all cases reported to the program, some of which were later determined to be unrelated to pesticide exposure.

2. **Relationship:** Degree of correlation between pesticide exposure and resulting symptomatology.

- Definite : High degree of correlation between pattern of exposure and resulting symptomatology. Requires both medical evidence (such as measured cholinesterase inhibition, positive allergy tests, characteristic signs observed by medical professional) and physical evidence of exposure (environmental and/or biological samples, exposure history) to support the conclusions.
- Probable : Relatively high degree of correlation exists between the pattern of exposure and the resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.
- Possible : Health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.
- Unlikely : A correlation cannot be ruled out absolutely. Medical and/or physical evidence suggest a cause other than pesticide exposure.
- Indirect : Pesticide exposure is not responsible, but pesticide regulations or product label requirements contributed in some way, (e.g. heat stress while wearing chemical resistant clothing).
- Asymptomatic : Exposure occurred, but did not result in illness/injury. Cholinesterase depression without symptoms falls in this category.
- Unrelated : Definite evidence of cause other than pesticide exposure including exposures to chemicals other than pesticides. Since there is no exposure to pesticides, there are no entries under "Type of Exposure" or "Intended Use."
- Insufficient : The available information is inadequate to make an informed judgment on the relationship between pesticide exposure and the reported symptomatology. For submitted investigations, the investigator failed to make an adequate attempt to obtain the necessary information. Since a relationship to pesticide exposure cannot be determined, there are no entries under "Type of Exposure" or "Intended Use."
- Unavailable : The available information is inadequate to make an informed judgment on the relationship between pesticide exposure and the reported symptomatology. For submitted investigations, the investigator made an adequate attempt to collect the necessary information, but was not able to do so (e.g., none of the parties concerned could be contacted). There usually needs to be more effort than to say the employee is not available for interview; other parties can often supply useful information. Since a relationship to pesticide exposure cannot be determined, there are no entries under "Type of Exposure" or "Intended Use."

3. **Type of Exposure:** Characterization of how an individual came in contact with a pesticide.

- Direct Contact : An appreciable amount of pesticide contacted the individual's body surface. This includes: 1) sprays or squirts from application equipment; 2) leaks or spills whether or not related to the application; and 3) deliberate immersion (as when cleaning implements in a basin with antimicrobials). This excludes drift exposures.
- Drift : Spray, mist, fumes, or odor carried from the target site by air. Drift must be related to an application or mix/load activity.

Residue : The part of a pesticide that remains in the environment for a period of time following an application or drift. This includes odor after the completion of an application.

Other/Unknown : Any of the following: 1) ingestion; 2) multiple routes of exposure; 3) residue from a spill; 4) exposure to smoke or pyrolytic products from a fire where pesticides are burning; 5) route of exposure is not known.

4. **Intended Use:** Agricultural/Non-Agricultural - Indicates whether the pesticide(s) were intended to contribute to the production of agricultural commodities.

Agricultural : The pesticide(s) were intended to contribute to the production of agricultural commodities, including livestock. This includes: 1) agricultural research facilities, 2) handling of raw agricultural commodities in packing houses, 3) drift from agricultural applications into non-agricultural areas, and 4) transportation and storage of pesticides on farm lands. It excludes forestry operations, although they are classified as agricultural for regulatory purposes. It also excludes manufacture, transportation, and storage of pesticides prior to arrival at the site of agricultural production.

Non-Agricultural : The pesticide(s) were not intended to contribute to the production of agricultural commodities. This includes: 1) residential pesticide uses, 2) structural pest control, 3) rights-of-way, 4) parks, 5) landscaped urban areas, and 6) manufacture, transportation and storage of pesticides except on farm lands.

5. This total includes one case in which the intended use could not be established as either agricultural or nonagricultural.

6. **County:** Individual counties in California where the incident occurred. If a county is not listed, there were no reported illnesses for that county for the year.

Whom to Contact:

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Worker Health and Safety Branch

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About the Pesticide Illness Surveillance Program Data

Pesticide-related illnesses have been tracked within the state of California for more than 50 years. The California Environmental Protection Agency, Department of Pesticide Regulation (DPR) maintains a surveillance program which records human health effects of pesticide exposure. The Pesticide Illness Surveillance Program (PISP) documents information on adverse effects from pesticide products, whether elicited by the active ingredients, inert ingredients, impurities, or breakdown products. This program maintains a database, which is utilized for evaluating the circumstances of pesticide exposures resulting in illness. This database is consulted regularly by staff who evaluate(s) the effectiveness of the DPR pesticide safety programs and recommend changes when appropriate.

**Cases Reported in California¹ with Documented² Pesticide Exposure
Summarized by the Type of Illness and the Type of Pesticides
2008**

Type of Illness ³	Antimicrobials ⁴		Cholinesterase Inhibitors ⁴		Other Pesticides ⁴		Total
	Occupational ⁵	Non-Occupational ⁵	Occupational ⁵	Non-Occupational ⁵	Occupational ⁵	Non-Occupational ⁵	
Systemic							
Systemic with Respiratory and Topical Effects	16	4	23	2	23	5	73
Systemic with Respiratory Effects	30	20	34	10	20	43	158
Systemic with Topical Effects	12	0	20	0	28	14	74
Systemic Only	8	25	45	20	43	69	210
Respiratory							
Respiratory with Topical Effects	10	9	10	3	11	7	50
Respiratory Only	18	33	14	15	7	13	100
Topical							
Eye Only	79	9	5	0	27	19	140
Skin Only	33	3	2	0	20	9	67
Eye and Skin	10	1	0	0	4	8	23
Asymptomatic							
Asymptomatic	3	1	28	3	10	5	50
TOTAL ⁶	219	105	181	53	193	192	945

¹ **Source:** California Department of Pesticide Regulation, Pesticide Illness Surveillance Program.

² **Documented Pesticide Exposure:** Includes cases classified as definitely, probably, or possibly related to pesticide exposure as well as documented pesticide exposure that did not result in symptomatology.

Definite : High degree of correlation between pattern of exposure and resulting symptomatology. Requires both medical evidence (such as measured cholinesterase inhibition, positive allergy tests, characteristic signs observed by medical professional) and physical evidence of exposure (environmental and/or biological samples, exposure history) to support the conclusions.

Probable : Relatively high degree of correlation exists between the pattern of exposure and the resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.

Possible : Health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

³ **Type of Illness:** Categorization of the type of symptoms experienced.

Systemic : Any health effects not limited to the respiratory, skin and/or eye. Cases involving multiple illness symptom types including systemic symptoms are included in the systemic category.

Respiratory : Health effects involving any part of the respiratory tree.

Topical : Health effects involving only the eyes and/or skin. This excludes outward physical signs (miosis and lacrimation) related to effects on internal bodily systems. These signs are classified under 'Systemic.'

Asymptomatic : Exposure occurred, but did not result in illness/injury. Cholinesterase depression without symptoms falls in this category.

⁴ **Type of Pesticide:** Type of pesticide based on functional class.

Antimicrobials : Pesticides used to kill or inactivate microbiological organisms (bacteria, viruses, etc.).

Cholinesterase Inhibitors : Pesticides known to inhibit the function of the cholinesterase enzyme.

Other Pesticides : Any pesticide that is not an antimicrobial or cholinesterase-inhibiting pesticide.

⁵ **Occupational or Non-Occupational:** The relationship between the illness/injury and the individual's work

Occupational : Work related. The individual was on the job at the time of the incident. This includes both paid employees and volunteers working in similar capacity to paid employees.

Non-Occupational : Not work related. The individual was not on the job at the time of the incident. This category includes individuals on the way to or from work (before the start or after the end of their workday).

⁶ This total includes two cases in which the activity could not be determined as occupational or non-occupational.

Whom to Contact:

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About the Pesticide Illness Surveillance Program Data

Pesticide-related illnesses have been tracked within the state of California for more than 50 years. The California Environmental Protection Agency, Department of Pesticide Regulation (DPR) maintains a surveillance program which records human health effects of pesticide exposure. The Pesticide Illness Surveillance Program (PISP) documents information on adverse effects from pesticide products, whether elicited by the active ingredients, inert ingredients, impurities, or breakdown products. This program maintains a database, which is utilized for evaluating the circumstances of pesticide exposures resulting in illness. This database is consulted regularly by staff who evaluate(s) the effectiveness of the DPR pesticide safety programs and recommend changes when appropriate.

**Illnesses and Injuries Reported in California¹ Associated With² Pesticide Exposure
Summarized by the Type of Activity and Type of Exposure
2008**

Occupational³

Type of Activity ⁴	Type of Exposure ⁵								
	Drift	Residue	Direct Spray/ Squirt	Spill/ Other Direct	Ingestion	Multiple	Other	Unknown	Total
Mixer/Loader	10	0	4	24	0	0	1	0	39
Applicator	19	2	16	51	0	2	12	33	135
Mechanical	1	0	5	3	0	0	0	1	10
Packaging/Processing	22	16	1	0	0	2	1	0	42
Field Worker	119	73	0	0	0	0	0	2	194
Routine Indoor	2	35	2	3	2	1	5	0	50
Routine Outdoor	8	0	0	0	0	0	3	0	11
Transport/Storage/Disposal	0	0	0	8	0	0	1	0	9
Emergency Response	0	0	0	7	0	0	4	0	11
Other	11	6	3	9	3	1	9	3	45
Unknown	2	0	0	2	0	0	1	1	6
Total Occupational Cases	194	132	31	107	5	6	37	40	552

Non-Occupational³

Type of Activity ⁴	Type of Exposure ⁵								
	Drift	Residue	Direct Spray/ Squirt	Spill/ Other Direct	Ingestion	Multiple	Other	Unknown	Total
Mixer/Loader	8	0	1	3	0	0	1	0	13
Applicator	39	1	17	15	0	6	5	15	98
Routine Indoor	29	16	8	4	36	6	2	7	108
Routine Outdoor	8	5	0	2	6	0	10	2	33
Transport/Storage/Disposal	0	0	0	1	0	0	0	0	1
Other	6	9	2	6	37	9	3	7	79
Unknown	1	1	2	2	1	0	1	1	9
Total Non-Occupational Cases	91	32	30	33	80	21	22	32	341
Total Occupational/ Non-Occupational⁶	286	164	61	141	85	27	59	72	895

¹ **Source:** California Department of Pesticide Regulation, Pesticide Illness Surveillance Program.

² **Associated With:** Includes cases classified as definitely, probably or possibly related to pesticide exposure

Definite : High degree of correlation between pattern of exposure and resulting symptomatology. Requires both medical evidence (such as measured cholinesterase inhibition, positive allergy tests, characteristic signs observed by medical professional) and physical evidence of exposure (environmental and/or biological samples, exposure history) to support the conclusions.

Probable : Relatively high degree of correlation exists between the pattern of exposure and the resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.

Possible : Health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

³ **Occupational Status:** Occupational or Non-Occupational

Occupational : Work related. The individual was on the job at the time of the incident. This includes both paid employees and volunteers working in similar capacity to paid employees.

Non-Occupational : Not work related. The individual was not on the job at the time of the incident. This category includes individuals on the way to or from work (before the start or after the end of their workday).

⁴ **Type of Activity:** Activity of the injured individual at the time of exposure

Mixer/Loader : Mixes and/or loads pesticides. This includes: (1) removing a pesticide from its original container, (2) transferring the pesticide to a mixing or holding tank, (3) mixing pesticides prior to application, (4) driving a nurse rig, or (5) transferring the pesticide from a mix/holding tank or nurse rig to an application tank.

Applicator : Applies pesticides by any method or conducts activities considered ancillary to the application (e.g., cleans spray nozzles in the field).

Mechanical : Maintains (e.g. cleans, repairs or conducts maintenance) pesticide contaminated equipment used to mix, load or apply pesticides as well as the protective equipment used by individuals involved in such activities. This excludes the following: 1) maintenance performed by applicators on their equipment incidental to the application; 2) maintenance performed by mixer/loaders on their equipment incidental to mixing and loading; 3) decontamination by HAZMAT teams.

Packaging/Processing : Handles (packs, processes or retails agricultural commodities from the packing house to the final market place. Field packing of agricultural commodities is classified as FIELD WORKER.

Field Worker : Works in an agricultural field performing tasks such as advising, scouting, harvesting, thinning, irrigating, driving tractor (except as part of an application), field packing, conducting cultural work in a greenhouse, etc. Researchers performing similar tasks in an agricultural field are also included.

Routine Indoor : Conducts activities in an indoor environment with minimal expectation for exposure to pesticides. This includes people in offices and businesses, residential structures, etc. who are not handling pesticides.

Routine Outdoor : Conducts activities in an outdoor environment with minimal expectation for exposure to pesticides. This excludes field workers in agricultural fields. This includes gardeners who are not handling pesticides.

Transport/ Storage/ Disposal	: Transports or stores pesticides between packaging and preparation for use. This includes shipping, warehousing and retailing as well as storage by the end-user prior to preparation for use. Disposal of unused pesticides is also included in this activity. This excludes driving a nurse rig to an application site.
Emergency Response	: Emergency Response Personnel (Police, fire, ambulance and HAZMAT personnel) responding to a fire, spill, accident or any other pesticide incident in the line of duty.
Other	: Activity is not adequately described by any other activity category. This includes but is not limited to: 1) being inside a vehicle; 2) dog groomers not handling pesticides; 3) individuals handling pesticide treated wood; 4) two or more activities with potential for pesticide exposure.
Unknown	: Activity is not known

⁵ **Type of Exposure:** Characterization of how an individual came in contact with a pesticide.

Drift	: Spray, mist, fumes, or odor carried from the target site by air. Drift must be related to an application or mix/load activity.
Residue	: The part of a pesticide that remains in the environment for a period of time following an application or drift. This includes odor after the completion of an application.
Direct Spray/Squirt	: Material propelled by the application or mix/load equipment. Contact with the material can be by direct projection or ricochet. This includes exposure of mechanics working on application or mix/load equipment when the material is forced out by pressure.
Spill/Other Direct	: Any of the following: 1) Contact made during an application or mixing/loading operation where the material is not propelled by the equipment; 2) Expected direct contact during use (e.g. washing dishes in a disinfectant solution); 3) Leaks, spills, etc. not related to an application.
Ingestion	: Intentional or unintentional oral ingestion.
Multiple	: Contact with pesticides occurred through two or more mechanisms.
Other	: Other known route of exposure not included in other exposure categories. This includes, but not limited to: 1) Residue from a spill and 2) Exposure to smoke or pyrolytic products from a fire where pesticides are burning.

Unknown : Route of exposure is not known.

⁶ This total includes two cases in which the activity could not be determined as occupational or non-occupational.

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About the Pesticide Illness Surveillance Program Data

Pesticide-related illnesses have been tracked within the state of California for more than 50 years. The California Environmental Protection Agency, Department of Pesticide Regulation (DPR) maintains a surveillance program which records human health effects of pesticide exposure. The Pesticide Illness Surveillance Program (PISP) documents information on adverse effects from pesticide products, whether elicited by the active ingredients, inert ingredients, impurities, or breakdown products. This program maintains a database, which is utilized for evaluating the circumstances of pesticide exposures resulting in illness. This database is consulted regularly by staff who evaluate(s) the effectiveness of the DPR pesticide safety programs and recommend changes when appropriate.

**Illnesses and Injuries Reported by California Physicians¹ Associated With²
Pesticide Exposure Summarized by Pesticide(s) and Type of Illness
2008**

Pesticide ³	Systemic/ Respiratory ⁴		Topical ⁴		TOTAL	
	Definite/ Probable	Possible	Definite/ Probable	Possible	Definite/ Probable	Possible
Organophosphates						
Bensulide	10	1	0	0	10	1
Chlorpyrifos	4	3	1	0	5	3
Diazinon	3	1	0	0	3	1
Dimethoate	0	1	0	0	0	1
Malathion	40	6	2	0	42	6
N-Methyl Carbamates						
Carbaryl	1	0	0	0	1	0
Methomyl	1	0	0	0	1	0
Propoxur	1	0	0	0	1	0
Pyrethrins and Pyrethroids						
Beta-Cyfluthrin	1	0	0	2	1	2
Bifenthrin	1	6	0	0	1	6
Cyfluthrin	0	3	0	0	0	3
Cypermethrin	7	2	1	0	8	2
Deltamethrin	1	1	0	0	1	1
Esfenvalerate	1	0	2	0	3	0
Gamma-Cyhalothrin	1	0	0	1	1	1
Lambda-Cyhalothrin	5	5	3	1	8	6
Permethrin	5	2	0	0	5	2
Resmethrin	1	0	0	0	1	0
Tralomethrin	1	1	0	0	1	1
Other Pesticides						
2,4-D	0	1	0	0	0	1
Adjuvant	1	0	1	0	2	0
Boric Acid	2	1	0	0	2	1
Bromethalin	0	1	0	0	0	1
Calcium Hypochlorite	4	1	1	0	5	1
Chlorine	4	0	0	0	4	0
Chlorothalonil	0	0	1	0	1	0
Copper Ammonium Complex	0	0	1	0	1	0
Copper Naphthenate	0	1	0	1	0	2
Copper Sulfate	0	1	0	0	0	1
Cyanuric Acid	7	1	7	1	14	2

PISP 2008: Summary of Cases by Pesticide and by Type of Illness- Page 1

Pesticide ³	Systemic/ Respiratory ⁴		Topical ⁴		TOTAL	
	Definite/ Probable	Possible	Definite/ Probable	Possible	Definite/ Probable	Possible
Deet	0	1	2	0	2	1
Diphacinone	1	1	0	0	1	1
Diquat	1	1	0	0	1	1
Ethylene Dichloride	0	1	0	0	0	1
Fenbutatin-oxide	1	0	0	0	1	0
Fipronil	0	1	0	0	0	1
Glufosinate-Ammonium	0	1	0	0	0	1
Glutaraldehyde	3	1	3	0	6	1
Glyphosate	3	4	8	5	11	9
Halogenated Hydantoin	0	1	0	0	0	1
Hydrogen Chloride	3	0	5	0	8	0
Imidacloprid	0	0	1	0	1	0
Indoxacarb	0	1	0	0	0	1
Isopropyl Alcohol	0	0	1	0	1	0
Lime-sulfur	0	0	1	0	1	0
Magnesium Chloride	0	0	1	0	1	0
Metaldehyde	0	1	0	0	0	1
Metam-sodium	17	0	8	0	25	0
Neem Oil	0	0	1	1	1	1
Peroxyacetic Acid	1	0	1	0	2	0
Phenolic Disinfectants	0	0	0	1	0	1
Phosphine	2	0	0	0	2	0
Pine Oil	3	1	2	0	5	1
Prometon	1	0	0	0	1	0
Quaternary Ammonia	10	6	32	4	42	10
Rimsulfuron	0	1	0	0	0	1
Sodium Hypochlorite	42	12	45	3	87	15
Spinosad	0	0	1	0	1	0
Strychnine	1	2	0	0	1	2
Sulfur	6	8	3	1	9	9
Sulfuryl Fluoride	7	12	0	1	7	13
Triclopyr	1	0	0	0	1	0
Trifloxystrobin	0	1	0	0	0	1
Trinexapac-ethyl	0	0	1	0	1	0
Zinc Naphthenate	1	0	0	0	1	0
Zinc Phosphide	1	0	0	0	1	0
Combinations of Antimicrobials	49	1	21	4	70	5
Combinations of Fumigants	10	2	2	0	12	2
Combinations of Fungicides	1	3	0	2	1	5

Pesticide ³	Systemic/ Respiratory ⁴		Topical ⁴		TOTAL	
	Definite/ Probable	Possible	Definite/ Probable	Possible	Definite/ Probable	Possible
Combinations of Herbicides	6	1	5	2	11	3
Combinations of Insecticides Including ChE Inhibitor(s)	10	6	1	1	11	7
Combinations of Insecticides Without ChE Inhibitor(s)	44	32	10	3	54	35
Miscellaneous Combinations	107	41	3	3	110	44
Unknown Antimicrobials	7	1	3	1	10	2
Unknown Herbicides	0	1	0	0	0	1
Unknown Insecticides	16	16	6	2	22	18
Unknown Pesticides	3	5	2	1	5	6
TOTAL	460	205	189	41	649	246

¹ **Source:** California Department of Pesticide Regulation, Pesticide Illness Surveillance Program.

² **Associated With:** Includes cases classified as definitely, probably or possibly related to pesticide exposure

Definite : High degree of correlation between pattern of exposure and resulting symptomatology. Requires both medical evidence (such as measured cholinesterase inhibition, positive allergy tests, characteristic signs observed by medical professional) and physical evidence of exposure (environmental and/or biological samples, exposure history) to support the conclusions.

Probable : Relatively high degree of correlation exists between the pattern of exposure and the resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.

Possible : Health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

³ **Type of Pesticide:** Pesticides listed on this table are grouped according to frequent inquiries received by DPR. Other pesticides are then listed in alphabetical order.

⁴ **Type of Illness:** Categorization of the type of symptoms experienced.

Systemic : Any health effects not limited to the skin and/or eye. Cases involving multiple illness symptom types including systemic symptoms are included in the systemic category.

Respiratory : Health effects involving any part of the respiratory tree.

Topical : Health effects involving only the eyes and/or skin. This excludes outward physical signs (miosis and lacrimation) related to effects on internal bodily systems. These signs are classified under 'Systemic.'

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About the Pesticide Illness Surveillance Program Data

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**Summary of Cases Reported by California¹ as Associated With² Pesticide
Exposure Summarized by Occupational Status and by
Location of the Incident
2008**

Incident Setting ³	Occupational Exposures ⁴		Non-Occupational Exposures ⁴		TOTAL ⁵	TOTAL ⁵
	Definite/ Probable ²	Possible ²	Definite/ Probable ²	Possible ²	Definite/ Probable ²	Possible ²
Farm	158	68	0	0	158	68
Nursery	2	7	0	0	2	7
Livestock Production Facility	4	0	0	0	4	0
Crop/Livestock Processing Facility	49	18	0	0	49	18
Animal Premise (Veterinary Hospital, Kennels, not Livestock)	4	0	0	1	4	1
Single Family Home	7	0	142	47	149	47
Multi-unit Housing	5	1	30	12	35	13
Residential Institution	4	1	2	0	6	1
School	12	5	6	0	18	5
Prison	3	0	4	0	7	0
Hospital/Medical	36	8	0	0	36	8
Pesticide Manufacturing Facility	1	0	0	0	1	0
Industrial or Other Manufacturing Facility	23	5	0	0	23	5
Office/Business	10	17	0	0	10	17
Retail Establishment	12	2	2	0	14	2
Service Establishment	41	11	4	1	45	12
Wholesale Establishment	3	0	0	0	3	0
Road/Rail Or Utility Right Of Way	3	2	4	3	7	5
Park	4	0	5	0	9	0
Landscape, Lawn	1	0	1	4	2	4
Landscape, Other	4	0	3	2	7	2
Other (Telephone Poles, Fences, Etc)	13	2	5	1	18	3
Unknown	3	3	38	24	42	28
TOTAL⁶	402	150	246	95	649	246

¹ **Source:** California Department of Pesticide Regulation, Pesticide Illness and Surveillance Program.

² **Associated With:** Includes cases classified as definitely, probably or possibly related to pesticide exposure

Definite : High degree of correlation between pattern of exposure and resulting symptomatology. Requires both medical evidence (such as measured cholinesterase inhibition, positive allergy tests, characteristic signs observed by medical professional) and physical evidence of exposure (environmental and/or biological samples, exposure history) to support the conclusions.

Probable : Relatively high degree of correlation exists between the pattern of exposure and the resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.

Possible : Health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

³ **Incident Setting:** Location where the incident occurred. The location may not coincide with the application site.

Farm : Areas where agricultural crops are grown. This excludes the following: 1) nurseries and greenhouses which are classified under NURSERY; 2) livestock and poultry farms; and 3) forestry operations.

Nursery : Facilities (including greenhouses) growing and selling plants, bulbs, seeds, etc. This includes the production of seedlings for transplanting into agricultural fields or forests.

Livestock Production Facility : Ranches, dairies, feedlots, egg production facilities, hatcheries and other establishments involved in keeping, grazing or feeding livestock or poultry for the sale of them or their products. This includes veterinary services provided for livestock.

Crop/Livestock Processing Facility : Facilities involved in packing, manufacturing or processing foods or beverages for human consumption and feed products for animals and fowl. This includes facilities that sort, grade and pack fresh fruits and vegetables.

Animal Premise (Veterinary Hospital, Kennels, Not Livestock) : Veterinary services, animal kennels, animal control facilities, dog grooming facilities and other services provided for companion animals. This excludes livestock.

Single Family Home : The house and other structures on property intended for use by a single family. This includes swimming pools, but excludes landscaped areas on the property.

Multi-Unit Housing : Apartments and multi-plexes and other buildings on property. This includes swimming pools, but excludes landscaped areas on the property.

Labor Housing : Lodging facility or residence provided for the labor force.

Residential Institution : Dormitories, nursing homes, homeless shelters and similar facilities.

School : Establishments that provide academic or technical instruction. This includes daycare centers.

Prison	: Establishments for the confinement and correction of offenders as ordered by courts of law. This includes California youth authority facilities.
Hospital / Medical	: Establishments that provide medical, surgical and other health services to people. This includes offices and clinics of doctors and dentists, hospitals, medical and dental laboratories, kidney dialysis centers and other health related facilities.
Pesticide Manufacturing Facility	: Facilities engaged in manufacture and/or formulation of pesticides.
Industrial Or Other Manufacturing Facility	: Facilities involved in the mechanical or chemical transformations of materials or substances into new products. This excludes: 1) facilities engaged in manufacture or formulation of pesticides; and 2) facilities engaged in treatment of wood to protect against pest damage.
Wood Treatment	: Establishments involved in the treatment of wood with preservatives to protect against pest damage.
Office/Business	: Commercial establishments including public and private business offices. This excludes retail establishments and service establishments.
Retail Establishment	: Businesses engaged in selling merchandise for personal or household consumption and providing services related to the products. This excludes restaurants which are classified under service establishment.
Service Establishment	: Establishments engaged in providing services to individuals, businesses and government. This includes restaurants, laundries, etc. This excludes medical service establishments.
Wholesale Establishment	: Establishments involved in the distribution of merchandise to retail establishments or other wholesale establishments. This excludes "wholesalers" who sell directly to the public.
Road/Rail Or Utility Right Of Way	: Roads, rails or utilities and adjacent right-of-way areas. This includes aqueducts, manholes, landscaped median strips and vehicles moving along roadways.
Park	: An area of public land set aside for recreation. This includes public swimming pool facilities. This excludes private recreational facilities such as amusement parks, physical fitness facilities, etc. which are classified under SERVICE ESTABLISHMENT.
Golf Course	: Land used for playing or practicing golf, including putting greens and driving ranges. This excludes miniature golf courses.
Landscape, Lawn	: Landscaped lawns. This excludes lawn areas in the following locations: 1) road/rail or utility right-of-ways; 2) parks; and 3) golf courses.
Landscape, Other	: Landscaped ornamental shrub and tree areas. This excludes ornamental shrub and tree areas in the following locations: 1) road/rail or utility right-of-ways; 2) parks; and 3) golf courses.

Other : Location of exposure occurred at a site not adequately described in any other incident setting category. This includes, but is not limited to, telephone poles, fences, water supply systems and wastewater treatment plants.

Unknown : The location of the incident is unknown.

⁴ **Occupational Status:** Occupational or Non-Occupational

Occupational : Work related. The individual was on the job at the time of the incident. This includes both paid employees and volunteers working in similar capacity to paid employees.

Non-Occupational : Not work related. The individual was not on the job at the time of the incident. This category includes individuals on the way to or from work (before the start or after the end of their workday).

⁶ These totals include two cases, one definite/probable and one possible, in which the activity could not be determined as occupational or non-occupational.

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**Summary of Cases Reported in California¹ as Associated With² Pesticide Exposure Summarized by Gender, Age Distribution, by Type of Pesticide and by Type of Use
2008**

Agricultural Use Pesticide Exposure Incidents³

Age Group	Pesticides other than Antimicrobial Pesticides ⁴			Antimicrobial Pesticides ⁴			TOTAL
	Male	Female	Unknown	Male	Female	Unknown	
0 - 9	3	3	0	0	0	0	6
10 - 14	2	0	0	0	0	0	2
15 - 19	18	4	0	0	0	0	22
20 - 29	52	36	0	4	3	0	95
30 - 39	37	12	0	8	2	0	59
40 - 49	32	8	0	6	6	0	52
50 - 59	27	12	0	3	4	0	46
60 - 69	7	0	0	0	0	0	7
70 +	0	1	0	0	0	0	1
Unknown	17	4	0	0	0	0	21
TOTAL⁵	195	80	0	21	15	0	311

Non-Agricultural Use Pesticide Exposure Incidents

Age Group	Pesticides other than Antimicrobial Pesticides			Antimicrobial Pesticides			TOTAL
	Male	Female	Unknown	Male	Female	Unknown	
0 - 9	24	22	0	16	14	0	76
10 - 14	5	1	0	2	10	0	18
15 - 19	6	5	0	5	9	0	25
20 - 29	29	11	0	29	28	0	97
30 - 39	19	22	0	27	32	0	100
40 - 49	27	22	0	23	36	0	108
50 - 59	23	21	0	13	24	0	81
60 - 69	14	12	0	1	11	0	38
70 +	5	6	0	1	1	0	13
Unknown	10	14	0	2	1	0	27
TOTAL⁵	162	136	0	119	166	0	583

¹ **Source:** California Department of Pesticide Regulation, Pesticide Illness and Surveillance Program.

² **Associated With:** Includes cases classified as definitely, probably or possibly related to pesticide exposure

- Definite : High degree of correlation between pattern of exposure and resulting symptomatology. Requires both medical evidence (such as measured cholinesterase inhibition, positive allergy tests, characteristic signs observed by medical professional) and physical evidence of exposure (environmental and/or biological samples, exposure history) to support the conclusions.
- Probable : Relatively high degree of correlation exists between the pattern of exposure and the resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.
- Possible : Health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

³ **Intended Use:** Agricultural/Non-Agricultural - Indicates whether the suspected pesticide(s) is intended to contribute to the production of agricultural commodities.

- Agricultural : The pesticide(s) were intended to contribute to the production of agricultural commodities, including livestock. This includes: 1) agricultural research facilities, 2) handling of raw agricultural commodities in packing houses, 3) drift from agricultural applications into non-agricultural areas, and 4) transportation and storage of pesticides on farm lands. It excludes forestry operations, although they are classified as agricultural for regulatory purposes. It also excludes manufacture, transportation, and storage of pesticides prior to arrival at the site of agricultural production.
- Non-Agricultural : The pesticide(s) were not intended to contribute to the production of agricultural commodities. This includes: 1) residential pesticide uses, 2) structural pest control, 3) rights-of-way, 4) parks, 5) landscaped urban areas, and 6) manufacture, transportation and storage of pesticides except on farm lands.

⁴ **Antimicrobial :** Pesticides used to kill or inactivate microbiological organisms (bacteria, viruses, etc.).

⁵ This total includes once case in which the intended use could not be established as either agricultural or non-agricultural.

Whom to Contact:

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About the Pesticide Illness Surveillance Program Data

Pesticide-related illnesses have been tracked within the state of California for more than 50 years. The California Environmental Protection Agency, Department of Pesticide Regulation (DPR) maintains a surveillance program which records human health effects of pesticide exposure. The Pesticide Illness Surveillance Program (PISP) documents information on adverse effects from pesticide products, whether elicited by the active ingredients, inert ingredients, impurities, or breakdown products. This program maintains a database, which is utilized for evaluating the circumstances of pesticide exposures resulting in illness. This database is consulted regularly by staff who evaluate(s) the effectiveness of the DPR pesticide safety programs and recommend changes when appropriate.

**Illnesses and Injuries of Application Workers Reported by California
Physicians¹ Associated With² Pesticide Exposure Summarized by the
Type of Equipment, Type of Activity and Occupational Status
2008**

Occupational³

Type of Equipment⁴	Type of Activity⁵				
	Mixer/ Loader	Applicator	Flagger	Mechanic	Total
Airblast Sprayers	2	6	0	0	8
Ground, Boom Below/Behind	1	3	0	0	4
Ground Boom, Other or Unspecified	0	1	0	0	1
Ground, Other or Unspecified	2	7	0	2	11
Pressurized Hose-line Sprayers	0	16	0	0	16
Hand Pump Sprayer	0	2	0	0	2
Back Pack Sprayer	0	8	0	0	8
Unpressurized Hand-held Spray Equipment	2	11	0	0	13
Aerosol Can	0	3	0	0	3
Hand, Other or Unspecified	1	7	0	0	8
Chamber	0	3	0	0	3
Automatic Equipment, Chlorinators	3	0	0	8	11
Automatic Equipment, Other or Unspecified	3	0	0	0	3
Immersion Equipment	6	5	0	0	11
Implements with Handles	1	2	0	0	3
Implements without Handles	0	12	0	0	12
Manual Placement	5	10	0	0	15
Manual Application Methods, Other or Unspecified	4	17	0	0	21
Other	2	0	0	0	2
Unknown	7	22	0	0	29
Total Occupational Cases	39	135	0	10	184

Non-Occupational³

Type of Equipment ⁴	Type of Activity ⁵				
	Mixer/ Loader	Applicator	Flagger	Mechanic	Total
Pressurized Hose-line Sprayers	0	1	0	0	1
Hand Pump Sprayer	1	5	0	0	6
Back Pack Sprayer	0	1	0	0	1
Unpressurized Hand-held Spray Equipment	0	6	0	0	6
Aerosol Can	0	9	0	0	9
Foggers	0	17	0	0	17
Hand, Other or Unspecified	0	9	0	0	9
Automatic Equipment, Chlorinators	1	0	0	0	1
Manual Placement	6	23	0	0	29
Manual Application Methods, Other or Unspecified	1	5	0	0	6
Implements with Handles	2	8	0	0	10
Other	0	1	0	0	1
Unknown	2	13	0	0	15
Total Non-Occupational Cases	13	98	0	0	111
Total Occupational and Non-Occupational Cases⁶	52	234	0	10	296

¹ **Source:** California Department of Pesticide Regulation, Pesticide Illness Surveillance Program.

² **Associated With:** Includes cases classified as definitely, probably or possibly related to pesticide exposure

Definite : High degree of correlation between pattern of exposure and resulting symptomatology. Requires both medical evidence (such as measured cholinesterase inhibition, positive allergy tests, characteristic signs observed by medical professional) and physical evidence of exposure (environmental and/or biological samples, exposure history) to support the conclusions.

Probable : Relatively high degree of correlation exists between the pattern of exposure and the resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.

Possible : Health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

³ **Occupational Status:** Occupational or Non-Occupational

Occupational	: Work related. The individual was on the job at the time of the incident. This includes both paid employees and volunteers working in similar capacity to paid employees.
Non-Occupational	: Not work related. The individual was not on the job at the time of the incident. This category includes individuals on the way to or from work (before the start or after the end of their workday).

⁴ **Type of Activity:** Activity of the injured individual at the time of exposure

Mixer/Loader	: Mixes and/or loads pesticides. This includes: (1) removing a pesticide from its original container, (2) transferring the pesticide to a mixing or holding tank, (3) mixing pesticides prior to application, (4) driving a nurse rig, or (5) transferring the pesticide from a mix/holding tank or nurse rig to an application tank.
Applicator	: Applies pesticides by any method or conducts activities considered ancillary to the application (e.g., cleans spray nozzles in the field).
Flagger	: Flags for an aerial application, either fixed-winged or helicopter.
Mechanical	: Maintains (e.g. cleans, repairs or conducts maintenance) pesticide contaminated equipment used to mix, load or apply pesticides as well as the protective equipment used by individuals involved in such activities. This excludes the following: 1) maintenance performed by applicators on their equipment incidental to the application; 2) maintenance performed by mixer/loaders on their equipment incidental to mixing and loading; 3) decontamination by HAZMAT teams.

⁵ **Type of Equipment Used:** Defines the type of application equipment regardless of who performed the application. If the type of equipment is not represented on the table, there were no cases involving that type of equipment for the year of the report.

Fixed Wing Aircraft	: Fixed wing aircraft.
Helicopter	: Helicopter.
Air, Other Or Unspecified	: Aerial application equipment, other or unspecified. This includes two or more types of aerial application equipment and excludes fixed wing aircraft and helicopters.
Over-The-Vine Boom	: Ground operated equipment with the arms of the spray boom extending over the tops of grapevines.
Electrostatic Sprayer	: Ground operated equipment designed to impart an electrical charge to the pesticide particles. The electrostatic designation for ground application equipment overrides any other type of equipment it is used with.
Airblast Sprayers	: Ground application equipment with a pump that delivers spray into an air stream created by a large fan at the back of the spray equipment.
Power Dusters	: Ground application equipment used to apply dust formulated pesticides.
Shank Injection Without Tarps	: Ground application equipment that uses a shank or other piece of equipment to directly apply a pesticide into the soil except when a tarp is placed over the soil,

which is classified under shank injection with tarps. This also excludes surface applied pesticides that are subsequently incorporated into the soil by a cultivator.

Shank Injection With Tarps	: Ground application equipment that uses a shank or other piece of equipment to directly apply a pesticide into the soil. A tarp is placed over the soil to restrict the pesticide to the application site.
Ground, Other Or Unspecified	: Ground application equipment, unknown or unspecified. This includes two or more types of ground application
Ground Boom, Other Or Unspecified	: Ground application equipment with a spray boom. The following are excluded: 1) Ground Boom Below/Behind, 2) Over-The-Vine Boom, and 3) Electrostatic Sprayer.
Ground Boom Below/Behind	: Ground application equipment with a spray boom located below or behind the equipment operator with the spray nozzles pointed downward.
Pressurized Hose-Line Sprayers	: Hand-held spray equipment attached by a long hose to a power-pressurized tank. This excludes hose-end sprayers, which are classified under hand, other or unspecified.
Hand Pump Sprayer	: Hand-held compressed air sprayer with small volume tanks (1 to 5 gallons). This excludes backpack sprayers.
Hand-Held Dusters	: Hand-held application equipment for granules or dust. This includes belly grinders, bellows, squeeze bulbs, etc.
Back Pack Sprayer	: Compressed air sprayer where the tank is worn on the back of the applicator.
Unpressurized Hand-Held Spray Equipment	: Hand-held spray bottles (usually plastic) with built-in finger triggers.
Aerosol Can	: Disposable pressurized cans designed for intermittent use. The pesticide is propelled out of the can by an inert compressed gas propellant. This excludes foggers.
Foggers	: Disposable pressurized cans designed for the total release of the contents in a single use. The pesticide is propelled out of the can by an inert compressed gas propellant.
Aerosol/Fog Generating Equipment	: Refillable application equipment designed to disperse pesticide as a small airborne droplet, either in confined spaces or outdoor areas. These include truck-mounted equipment for outdoor use, hand-carried portable units and wall mounted electric units that are found in dairies, restaurants, etc.
Hand, Other Or Unspecified	: Hand-held application equipment, other or unspecified. The equipment must propel the pesticide from a reservoir. This includes 1) hose-end sprayers, and 2) two or more types of hand-held application equipment. This excludes hand-held equipment already specified above.
Chamber	: An enclosed, sealed chamber designed specifically for fumigating or sterilizing the contents of the chamber.
Tarp	: Tarp placed over a commodity or structure and designed to restrict a fumigant to the application site.
Automatic Equipment, Chlorinators	: Chlorination units that automatically inject chlorine into water for disinfection purposes. This includes chlorinators for swimming pools, packing houses and food processing plants.

Drip Irrigation Equipment	: Chemigation through drip irrigation equipment.
Sprinkler Irrigation Equipment	: Chemigation through sprinkler irrigation equipment.
Automatic Equipment, Other Or Unspecified	: Equipment that automatically injects the pesticide to the target area. This includes equipment attached to milking machinery, dishwashers, etc. This excludes equipment already described above.
Immersion Equipment	: Tanks, trays, sinks, etc. used for the dipping of animals, produce, bulbs, medical equipment, dishes, pots and pans, etc.
Implements With Handles	: Mops, brushes, and other implements with handles.
Implements Without Handles	: Cloths, towels, rags, sponges and other implements without handles.
Manual Placement	: Manual placement of a pesticide directly to a target site. This includes bait stations, hand tossed pellets, and direct pouring of a pesticide onto a target surface from a container (such as pouring liquid chlorine directly into swimming pool water). This excludes the placement of fumigation pellet packs in chambers and under tarps.
Manual Application Methods, Other Or Unspecified	: Manual application methods, other or unspecified. The pesticide is not propelled by any type of equipment. This includes two or more types of manual application methods. This excludes manual application method already described above.
Other	: Any application methodology not described above. This includes two or more types of application equipment not elsewhere specified.
Unknown	: The type of application equipment is not known.
Not Applicable	: No application equipment is involved.

⁶ This total includes one case in which the activity could not be determined as occupational or non-occupational.

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**Hospitalization and Disability Associated with Illnesses/Injuries *Definitely or Probably Related* to Pesticide Exposure in California^{1,2},
Summarized by Occupational Status and Activity
2008**

Occupational³

Activity ⁴	Total Cases	Hospitalization			Disability		
		No. Cases	%	Unknown ⁵	No. Cases	%	Unknown ⁶
Mixer/Loader	38	1	2.6	0	7	18.4	3
Applicator	99	0	0	0	22	22.2	7
Mechanical	9	0	0	0	3	33.3	0
Packaging/Processing	24	1	4.2	0	7	29.2	2
Field Worker	140	0	0	0	17	12.1	3
Routine Indoor	24	0	0	0	2	8.3	0
Routine Outdoor	9	1	11.1	0	1	11.1	0
Transport/Storage/Disposal	9	0	0	0	1	11.1	1
Emergency Response	11	0	0	0	0	0	1
Other	34	1	2.9	0	10	29.4	10
Unknown	5	0	0	0	1	20	1
Total Occupational	402	4	1	0	71	17.7	28

Non-Occupational³

Activity ⁴	Total Cases	Hospitalization			Disability		
		No. Cases	%	Unknown ⁵	No. Cases	%	Unknown ⁶
Mixer/Loader	12	0	0	0	1	8.3	1
Applicator	75	4	5.3	1	4	5.3	25
Routine Indoor	75	1	1.3	0	2	2.7	14
Routine Outdoor	24	0	0	0	0	0	10
Transport/Storage/Disposal	1	0	0	0	0	0	0
Other	54	14	25.9	2	9	16.7	21
Unknown	5	0	0	0	0	0	2
Total Non-Occupational	246	19	7.7	3	16	6.5	73
TOTAL⁷ CASES	649	23	3.5	3	87	13.4	102

¹ **Source:** California Department of Pesticide Regulation, Pesticide Illness Surveillance Program.

² **Relationship:** Degree of correlation between pesticide exposure and resulting symptomatology.

Definite : High degree of correlation between pattern of exposure and resulting symptomatology. Requires both medical evidence (such as measured cholinesterase inhibition, positive allergy tests, characteristic signs observed by medical professional) and physical evidence of exposure (environmental and/or biological samples, exposure history) to support the conclusions.

Probable : Relatively high degree of correlation exists between the pattern of exposure and the resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.

³ **Occupational Status:** Occupational or Non-Occupational

Occupational : Work related. The individual was on the job at the time of the incident. This includes both paid employees and volunteers working in similar capacity to paid employees.

Non-Occupational : Not work related. The individual was not on the job at the time of the incident. This category includes individuals on the way to or from work (before the start or after the end of their workday).

⁴ **Type of Activity:** Activity of the individual at the time of exposure.

Mixer/Loader : Mixes and/or loads pesticides. This includes: (1) removing a pesticide from its original container, (2) transferring the pesticide to a mixing or holding tank, (3) mixing pesticides prior to application, (4) driving a nurse rig, or (5) transferring the pesticide from a mix/holding tank or nurse rig to an application tank.

Applicator : Applies pesticides by any method or conducts activities considered ancillary to the application (e.g., cleans spray nozzles in the field).

Flagger : Flags for an aerial application, either fixed-winged or helicopter.

Mechanical : Maintains (e.g. cleans, repairs or conducts maintenance) pesticide contaminated equipment used to mix, load or apply pesticides as well as the protective equipment used by individuals involved in such activities. This excludes the following: 1) maintenance performed by applicators on their equipment incidental to the application; 2) maintenance performed by mixer/loaders on their equipment incidental to mixing and loading; 3) decontamination by HAZMAT teams.

Packaging and Processing : Handles (packs, processes or retails agricultural commodities from the packing house to the final market place. Field packing of agricultural commodities is classified as FIELD WORKER.

Field Worker : Works in an agricultural field performing tasks such as advising, scouting, harvesting, thinning, irrigating, driving tractor (except as part of an application), field packing, conducting cultural work in a greenhouse, etc. Researchers performing similar tasks in an agricultural field are also included.

Routine Indoor : Conducts activities in an indoor environment with minimal expectation for exposure to pesticides. This includes people in offices and businesses, residential structures, etc. who are not handling pesticides.

Manufacturing and Formulation : Manufactures, processes or packages pesticides. This includes “mixing” if it is done in a plant for application elsewhere.

Transport/ : Transports or stores pesticides between packaging and preparation for use. This includes

Storage/ Disposal	shipping, warehousing and retailing as well as storage by the end-user prior to preparation for use. Disposal of unused pesticides is also included in this activity. This excludes driving a nurse rig to an application site.
Emergency Response	: Emergency Response Personnel (Police, fire, ambulance and HAZMAT personnel) responding to a fire, spill, accident or any other pesticide incident in the line of duty.
Other	: Activity is not adequately described by any other activity category. This includes but is not limited to: 1) being inside a vehicle; 2) dog groomers not handling pesticides; 3) individuals handling pesticide treated wood; 4) two or more activities with potential for pesticide exposure.
Unknown	: Activity is not known

⁵ **Hospitalization Unknown:** Investigation did not specify whether hospitalization occurred or not.

⁶ **Disability Unknown:** Investigation did not specify whether disability occurred or not.

⁷ This total includes one case in which the activity could not be determined as occupational or non-occupational.

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**Hospitalization and Disability Associated with Illnesses/Injuries
Possibly Related to Pesticide Exposure in California^{1,2},
Summarized by Occupational Status and Activity
2008**

Occupational³

Activity ⁴	Total Cases	Hospitalization			Disability		
		No. Cases	%	Unknown ⁵	No. Cases	%	Unknown ⁶
Mixer/Loader	1	0	0	0	1	100	0
Applicator	36	2	5.6	0	5	13.9	3
Mechanical	1	0	0	0	1	100	0
Packaging/Processing	18	1	5.6	0	5	27.8	1
Field Worker	54	0	0	0	5	9.3	2
Routine Indoor	26	0	0	0	2	7.7	3
Routine Outdoor	2	0	0	0	0	0	0
Other	11	0	0	0	4	36.4	3
Unknown	1	0	0	0	0	0	1
Total Occupational	150	3	2	0	23	15.3	13

Non- Occupational³

Activity	Total Cases	Hospitalization			Disability		
		No. Cases	%	Unknown ⁵	No. Cases	%	Unknown ⁶
Mixer/Loader	1	0	0	0	0	0	0
Applicator	23	1	4.3	0	2	8.7	9
Routine Indoor	33	0	0	0	2	6.1	7
Routine Outdoor	9	0	0	0	0	0	0
Other	25	7	28	3	5	20	10
Unknown	4	0	0	0	0	0	4
Total Non-Occupational	95	8	8.4	3	9	9.5	30
Total⁷ Cases	246	11	4.5	3	32	13	44

¹ **Source:** California Department of Pesticide Regulation, Pesticide Illness Surveillance Program.

² **Relationship:** Degree of correlation between pesticide exposure and resulting symptomatology.

Possible : Some degree of correlation evident. Medical and physical evidence are inconclusive or unavailable.

³ **Occupational Status:** Occupational or Non-Occupational

Occupational : Work related. The individual was on the job at the time of the incident. This includes both paid employees and volunteers working in similar capacity to paid employees.

Non-Occupational : Not work related. The individual was not on the job at the time of the incident. This category includes individuals on the way to or from work (before the start or after the end of their workday).

⁴ **Type of Activity:** Activity of the individual at the time of exposure.

Mixer/Loader	: Mixes and/or loads pesticides. This includes: (1) removing a pesticide from its original container, (2) transferring the pesticide to a mixing or holding tank, (3) mixing pesticides prior to application, (4) driving a nurse rig, or (5) transferring the pesticide from a mix/holding tank or nurse rig to an application tank.
Applicator	: Applies pesticides by any method or conducts activities considered ancillary to the application (e.g., cleans spray nozzles in the field).
Flagger	: Flags for an aerial application, either fixed-winged or helicopter.
Mechanical	: Maintains (e.g. cleans, repairs or conducts maintenance) pesticide contaminated equipment used to mix, load or apply pesticides as well as the protective equipment used by individuals involved in such activities. This excludes the following: 1) maintenance performed by applicators on their equipment incidental to the application; 2) maintenance performed by mixer/loaders on their equipment incidental to mixing and loading; 3) decontamination by HAZMAT teams.
Packaging and Processing	: Handles (packs, processes or retails agricultural commodities from the packing house to the final market place. Field packing of agricultural commodities is classified as FIELD WORKER.
Field Worker	: Works in an agricultural field performing tasks such as advising, scouting, harvesting, thinning, irrigating, driving tractor (except as part of an application), field packing, conducting cultural work in a greenhouse, etc. Researchers performing similar tasks in an agricultural field are also included.
Routine Indoor	: Conducts activities in an indoor environment with minimal expectation for exposure to pesticides. This includes people in offices and businesses, residential structures, etc. who are not handling pesticides.
Transport/ Storage/ Disposal	: Transports or stores pesticides between packaging and preparation for use. This includes shipping, warehousing and retailing as well as storage by the end-user prior to preparation for use. Disposal of unused pesticides is also included in this activity. This excludes driving a nurse rig to an application site.
Emergency Response	: Emergency Response Personnel (Police, fire, ambulance and HAZMAT personnel) responding to a fire, spill, accident or any other pesticide incident in the line of duty.
Other	: Activity is not adequately described by any other activity category. This includes but is not limited to: 1) being inside a vehicle; 2) dog groomers not handling pesticides; 3) individuals handling pesticide treated wood; 4) two or more activities with potential for pesticide exposure.
Unknown	: Activity is not known

⁵ **Hospitalization Unknown:** Investigation did not specify whether hospitalization occurred or not.

⁶ **Disability Unknown:** Investigation did not specify whether disability occurred or not.

⁷ This total includes one case in which the activity could not be determined as occupational or non-occupational.

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***Agricultural Drift* Cases Reported in California¹ Associated With² Pesticide
Exposure Summarized by Application Sites
2008**

Application Site³	Number of Cases⁴	Number of Incidents⁵
BERRIES		
Strawberries	1	1
CITRUS		
Lemons	21	1
FIXTURES		
Milking Equipment (Milking Machine, Etc.)	1	1
FORAGE CROP		
Alfalfa	35	2
FRUITING VEGETABLE		
Tomatoes	9	4
GRAIN		
Corn	1	1
GRAPES		
Grapes	5	2
HERB/SPICE		
Flavoring and Spice Crops (Other or Unspecified)	11	1
LEAFY/STEM VEGETABLE		
Broccoli	24	1
Lettuce	18	2
MULTIPLE		
Beets, Cabbage	1	1
Grapes, Uncultivated Non-agricultural Areas	7	1
NON-CROP		
Soil	39	2
Uncultivated Agricultural Areas (Other or Unspecified)	1	1
NOT APPLICABLE		
Not Applicable	1	1
NUT TREES		

Application Site ³	Number of Cases ⁴	Number of Incidents ⁵
Almonds	2	2
Walnuts	2	2
STONE FRUIT		
Prunes	1	1
TOTAL	180	27

¹ **Source:** California Department of Pesticide Regulation, Pesticide Illness and Surveillance Program.

² **Associated With:** Includes cases classified as definitely, probably or possibly related to pesticide exposure

Definite : High degree of correlation between pattern of exposure and resulting symptomatology. Requires both medical evidence (such as measured cholinesterase inhibition, positive allergy tests, characteristic signs observed by medical professional) and physical evidence of exposure (environmental and/or biological samples, exposure history) to support the conclusions.

Probable : Relatively high degree of correlation exists between the pattern of exposure and the resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.

Possible : Health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

³ **Application Sites:** Site of the pesticide application. For crops, this includes applications at the growing site and to the commodity while being packed for sale. For incidents involving drift, the intended application site is listed.

⁴ **Cases by Incidents:** Indicates the number of individuals exposed in one incident of agricultural drift.

⁵ **Incidents:** Indicates the number of episodes where agricultural pesticide drift occurred based on the application site.

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**Agricultural Drift Cases¹ Reported by California Physicians as Associated
With² Pesticide Exposure Summarized by the Activity of the Exposed Person
and by the Type of Application Equipment Used
2008**

Type of Application Equipment Used ³	Type of Activity ⁴				TOTAL
	Routine Indoor	Routine Outdoor	Field Worker	Other	
Fixed Wing Aircraft	1	7	35	0	43
Helicopter	0	0	2	0	2
Airblast Sprayers	0	1	2	0	3
Ground, Boom Below/Behind	0	0	1	1	2
Ground Boom, Other or Unspecified	19	2	27	3	51
Power Dusters	0	1	1	0	2
Ground, Other or Unspecified	0	0	8	2	10
Shank Injection without Tarps	0	0	39	0	39
Back Pack Sprayer	0	0	0	1	1
Hand, Other or Unspecified	0	0	0	1	1
Automatic Equipment, Other or Unspecified	0	0	0	21	21
Other	0	0	0	1	1
Unknown	0	0	4	0	4
TOTAL	20	11	119	30	180

¹ **Source:** California Department of Pesticide Regulation, Pesticide Illness Surveillance Program

² **Associated With:** Includes cases classified as definitely, probably or possibly related to pesticide exposure

Definite : High degree of correlation between pattern of exposure and resulting symptomatology. Requires both medical evidence (such as measured cholinesterase inhibition, positive allergy tests, characteristic signs observed by medical professional) and physical evidence of exposure (environmental and/or biological samples, exposure history) to support the conclusions.

Probable : Relatively high degree of correlation exists between the pattern of exposure and the resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.

Possible : Health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

³ **Type of Equipment Used:** Defines the type of application equipment regardless of who performed the application. If the type of equipment is not represented on the table, there were no cases involving that type of equipment for the year of the report.

Fixed Wing : Fixed wing aircraft.

Aircraft

Helicopter : Helicopter.

Airblast Sprayers	: Ground application equipment with a pump that delivers spray into an air stream created by a large fan at the back of the spray equipment.
Power Dusters	: Ground application equipment used to apply dust formulated pesticides.
Shank Injection Without Tarps	: Ground application equipment that uses a shank or other piece of equipment to directly apply a pesticide into the soil except when a tarp is placed over the soil, which is classified under shank injection with tarps. This also excludes surface applied pesticides that are subsequently incorporated into the soil by a cultivator.
Ground, Other Or Unspecified	: Ground application equipment, unknown or unspecified. This includes two or more types of ground application equipment
Ground Boom, Other Or Unspecified	: Ground application equipment with a spray boom. The following are excluded: 1) Ground Boom Below/Behind, 2) Over-The-Vine Boom, and 3) Electrostatic Sprayer.
Ground Boom Below/Behind	: Ground application equipment with a spray boom located below or behind the equipment operator with the spray nozzles pointed downward.
Back Pack Sprayer	: Compressed air sprayer where the tank is worn on the back of the applicator.
Unpressurized Hand-Held Spray Equipment	: Hand-held spray bottles (usually plastic) with built-in finger triggers.
Hand, Other Or Unspecified	: Hand-held application equipment, other or unspecified. The equipment must propel the pesticide from a reservoir. This includes 1) hose-end sprayers, and 2) two or more types of hand-held application equipment. This excludes hand-held equipment already specified above.
Other	: Any application methodology not described above. This includes two or more types of application equipment not elsewhere specified.
Unknown	: The type of application equipment is not known.

⁴Type of Activity: Activity of the individual at the time of exposure.

Field Worker	Works in an agricultural field performing tasks such as advising, scouting, harvesting, thinning, irrigating, driving tractor (except as part of an application), field packing, conducting cultural work in a greenhouse, etc. Researchers performing similar tasks in an agricultural field are also included.
Routine Indoor	Conducts activities in an indoor environment with minimal expectation for exposure to pesticides. This includes people in offices and businesses, residential structures, etc. who are not handling pesticides.
Routine Outdoor	Conducts activities in an outdoor environment with minimal expectation for exposure to pesticides. This excludes field workers in agricultural fields. This includes gardeners who are not handling pesticides.
Other	Any activity, including handling pesticides, other than routine indoor, routine outdoor, or field work.

Whom to Contact:

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Worker Health and Safety Branch

Phone: (916) 445-4222.

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About the Pesticide Illness Surveillance Program Data

Pesticide-related illnesses have been tracked within the state of California for more than 50 years. The California Environmental Protection Agency, Department of Pesticide Regulation (DPR) maintains a surveillance program which records human health effects of pesticide exposure. The Pesticide Illness Surveillance Program (PISP) documents information on adverse effects from pesticide products, whether elicited by the active ingredients, inert ingredients, impurities, or breakdown products. This program maintains a database, which is utilized for evaluating the circumstances of pesticide exposures resulting in illness. This database is consulted regularly by staff who evaluate(s) the effectiveness of the DPR pesticide safety programs and recommend changes when appropriate.

Illnesses and Injuries in California¹ Associated With Pesticide Residue in Agricultural Fields, 1982-2008

Year	Systemic/ Respiratory ²		Topical ²		TOTAL
	Definite/ Probable ³	Possible ³	Definite/ Probable ³	Possible ³	
1982	23	43	48	117	231
1983	19	29	41	96	185
1984	8	9	49	112	178
1985	25	24	156	164	370
1986	30	14	155	60	259
1987	58	83	52	180	375
1988	57	37	74	202	370
1989	17	22	30	93	162
1990	3	32	11	119	165
1991	16	38	7	87	148
1992	11	57	19	112	199
1993	10	38	2	67	117
1994	33	31	5	42	111
1995	20	48	74	89	231
1996	29	37	15	60	141
1997	83	44	20	62	209
1998	40	19	5	47	111
1999	23	17	0	42	82
2000	21	30	2	22	75
2001	7	22	0	17	46
2002	30	23	13	12	78
2003	4	17	4	33	58
2004	15	27	1	25	68
2005	1	9	2	16	28
2006	1	9	2	13	25
2007	24	15	1	18	58
2008	48	16	2	7	73
Total	656	790	790	1914	4153

¹ **Source:** California Department of Pesticide Regulation, Pesticide Illness and Surveillance Program.

² **Type of Illness:** Categorization of the type of symptoms experienced.

- Systemic : Any health effects not limited to the respiratory or skin and/or eye. Cases involving multiple illness symptom types including systemic symptoms are included in the systemic category.
- Respiratory : Health effects involving any part of the respiratory tree.
- Topical : Health effects involving only the eyes and/or skin. This excludes outward physical signs (miosis and lacrimation) related to effects on internal bodily systems. These signs are classified under 'Systemic.'

³ **Associated With:** Includes cases classified as definitely, probably or possibly related to pesticide exposure.

- Definite : High degree of correlation between pattern of exposure and resulting symptomatology. Requires both medical evidence (such as measured cholinesterase inhibition, positive allergy tests, characteristic signs observed by medical professional) and physical evidence of exposure (environmental and/or biological samples, exposure history) to support the conclusions.
- Probable : Relatively high degree of correlation exists between the pattern of exposure and the resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.
- Possible : Health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

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**Incidents Involving *Field Workers* Reported in California¹ Associated
With² Pesticide Residue Exposure Summarized by Crop and
Type of Illness
2008**

Crop	Systemic/ Respiratory ³		Topical ³		TOTAL
	Definite/ Probable	Possible	Definite/ Probable	Possible	
BERRIES					
Strawberries	47	10	1	0	58
GRAIN					
Corn	0	0	0	1	1
GRAPES					
Grapes	1	1	0	2	4
LEAFY/STEM VEGETABLE					
Lettuce	0	4	0	0	4
MULTIPLE					
Almonds, Uncultivated Agricultural Areas (Other or Unspecified)	0	0	0	1	1
NUT TREES					
Almonds	0	0	1	1	2
ORNAMENTAL					
Ornamental Plants (Other or Unspecified)	0	0	0	1	1
OTHER FRUIT					
Olives	0	0	0	1	1
SEEDS					
Seeds (Agricultural & Ornamental)	0	1	0	0	1
TOTAL	48	16	2	7	73

¹ **Source:** California Department of Pesticide Regulation, Pesticide Illness and Surveillance Program.

² **Associated With:** Includes cases classified as definitely, probably or possibly related to pesticide exposure

Definite : High degree of correlation between pattern of exposure and resulting symptomatology.
Requires both medical evidence (such as measured cholinesterase inhibition, positive allergy tests, characteristic signs observed by medical professional) and physical evidence of exposure (environmental and/or biological samples, exposure history) to support the conclusions.

PISP 2008: Field Worker Cases by Crop and by Type of Illness- Page 1

Probable : Relatively high degree of correlation exists between the pattern of exposure and the resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.

Possible : Health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

³ **Type of Illness:** Categorization of the type of symptoms experienced.

Systemic : Any health effects not limited to the respiratory or skin and/or eye. Cases involving multiple illness symptom types including systemic symptoms are included in the systemic category.

Respiratory : Health effects involving any part of the respiratory tree.

Topical : Health effects involving only the eyes and/or skin. This excludes outward physical signs (miosis and lacrimation) related to effects on internal bodily systems. These signs are classified under 'Systemic.'

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Pesticide-Associated Illnesses and Injuries Reported In California Schools^{1,2}
by Exposure Category, Pesticide Type and Illness Symptoms
2008

Exposure ³	Systemic/Respiratory ⁴			Topical ⁴			TOTAL
	Antimicrobials ⁵	Cholinesterase Inhibitors ⁵	Other Pesticides ⁵	Antimicrobials ⁵	Cholinesterase Inhibitors ⁵	Other Pesticides ⁵	
Drift	1	0	0	0	0	0	1
Residue	1	0	2	0	0	0	3
Direct Spray/Squirt	0	0	0	1	0	1	2
Spill/Other Direct	1	0	0	5	0	1	7
Ingestion	1	0	0	0	0	0	1
Other	7	0	0	0	0	0	7
Unknown	0	0	0	2	0	0	2
TOTAL	11	0	2	8	0	2	23

¹ **Source:** California Department of Pesticide Regulation, Pesticide Illness Surveillance Program.

² **Associated With:** Includes cases classified as definitely, probably or possibly related to pesticide exposure

Definite : High degree of correlation between pattern of exposure and resulting symptomatology. Requires both medical evidence (such as measured cholinesterase inhibition, positive allergy tests, characteristic signs observed by medical professional) and physical evidence of exposure (environmental and/or biological samples, exposure history) to support the conclusions.

Probable : Relatively high degree of correlation exists between the pattern of exposure and the resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.

Possible : Health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

³**Type of Exposure:** Characterization of how an individual came in contact with a pesticide. Exposure categories not listed on the table indicate there were no illnesses that occurred under that category.

Drift	: Spray, mist, fumes, or odor carried from the target site by air. Drift must be related to an application or mix/load activity.
Residue	: The part of a pesticide that remains in the environment for a period of time following an application or drift. This includes odor after the completion of an application.
Direct Spray/Squirt	: Material propelled by the application or mix/load equipment. Contact with the material can be by direct projection or ricochet. This includes exposure of mechanics working on application or mix/load equipment when the material is forced out by pressure.
Spill/Other Direct	: Any of the following: 1) Contact made during an application or mixing/loading operation where the material is not propelled by the equipment; 2) Expected direct contact during use (e.g. washing dishes in a disinfectant solution); 3) Leaks, spills, etc. not related to an application.
Ingestion	: Intentional or unintentional oral ingestion.
Other	: Other known route of exposure not included in other exposure categories. This includes, but not limited to: 1) Residue from a spill and 2) Exposure to smoke or pyrolytic products from a fire where pesticides are burning.
Unknown	: Route of exposure is not known.

⁴**Type of Illness:** Categorization of the type of symptoms experienced.

Systemic	: Any health effects not limited to the respiratory, skin and/or eye. Cases involving multiple illness symptom types including systemic symptoms are included in the systemic category.
Respiratory	: Health effects involving any part of the respiratory tree.
Topical	: Health effects involving only the eyes and/or skin. This excludes outward physical signs (miosis and lacrimation) related to effects on internal bodily systems. These signs are classified under 'Systemic.'
Asymptomatic	: Exposure occurred, but did not result in illness/injury. Cholinesterase depression without symptoms falls in this category.

⁵ **Type of Pesticide:** Type of pesticide based on functional class.

Antimicrobials : Pesticides used to kill or inactivate microbiological organisms (bacteria, viruses, etc.).

Cholinesterase Inhibitors : Pesticides known to inhibit the function of the cholinesterase enzyme.

Other Pesticides : Any pesticide that is not an antimicrobial or cholinesterase-inhibiting pesticide.

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